2012-2013 Progress Report

Vehicle & Engine Compliance Activities












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2. Chapter II, Scope of EPA's Vehicle, Engine, Equipment, and Fuel Compliance Programs, describes the laws that authorize EPA's mobile source compliance activity.

3. Chapter III, Compliance Programs and Processes, describes the compliance programs and processes in more detail and provides compliance data and other information organized by industry sector. Please refer to Figure 1 on the next page for examples of the vehicles, engines, and equipment that are included in each industry sector.

4. Chapter IV, Industry Statistics, presents industry statistics that are contained within the compliance information that EPA collects.

I. Foreword by the Compliance Division Director

MY 2012 – 2013 Compliance Report

This is the fourth in a series of vehicle and engine compliance reports issued by the U.S. Environmental Protection Agency – Office of Transportation and Air Quality – Compliance Division. These reports offer a convenient reference to the data that the Compliance Division collects in implementing emissions regulations for vehicles, engines, and other motorized equipment. The environmental programs the Compliance Division implements apply to virtually every vehicle, engine and gallon of transportation fuel sold in the United States. It is EPA's job to make sure that these regulated mobile sources comply with emissions and fuel economy requirements. The Compliance Division's role in the Office of Transportation and Air Quality is essential to realizing the Agency's national air quality and public health goals.

The 2012 – 2013 Progress Report on vehicle and engine compliance activities (2012 – 2013 Compliance Report) updates and builds upon the data and information presented in the first three reports which cover compliance activities for the 2007 – 2011 model years. These reports can be found on our web site at http://www.epa.gov/otaq/hwy.htm. This report presents certification data and other types of information EPA collected for model years (MY) 2012 and 2013 and for calendar years (CY) 2012 and 2013.[1]

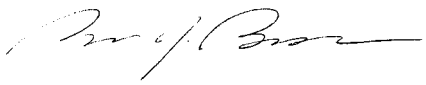
The Compliance Division oversees a broad set of compliance activities to ensure that vehicle and engine manufacturers satisfy their regulatory obligations. These activities range from issuing certificates of conformity before vehicles and engines enter into commerce to monitoring in-use testing and reporting afterward. In addition to regulating vehicles and engines, EPA regulates motor vehicle fuels, including gasoline, diesel and renewable fuels such as ethanol and biodiesel. Please see EPA's fuels web site, http://epa.gov/otaq/fuels/, for further information about the fuel compliance program.

We recommend that readers who are unfamiliar with EPA's mobile source emission control programs refer to the 2007 Compliance Report for additional background information, including descriptions of the vehicle, engine, and fuel categories EPA regulates.

[1]Some information is reported by model year while other types of information (e.g., recalls and defects) are reported by calendar year.

On an annual basis, EPA issues a report documenting light duty manufacturers' compliance with the light duty greenhouse gas (GHG) standards. These standards apply to cars and light trucks, beginning with the 2012 model year. Manufacturers must meet standards for tailpipe methane and nitrous oxide emissions, plus increasingly stringent fleet average standards for carbon dioxide in each model year through 2025. Reports for both 2012 and 2013 model years have been published, please refer to these two reports for detailed information on the light duty GHG program.

The highlights that follow provide additional examples of information that is available today and that is explained in more detail in the body of the report.



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HIGHLIGHTS

Highlight 1 – EPA Investigation Prompts Carmakers to Correct Inflated Fuel Economy Claims

The fuel economy label (the window sticker that appears on new cars) provides consumers with reliable and repeatable estimates of real-world fuel economy for national average drivers and conditions. This allows consumers to compare fuel economy across different car models. EPA requires auto manufacturers to *revise* miles per gallon (MPG) values on fuel economy labels if relevant information becomes available that shows that the original values are too high.

EPA oversees the MPG values on fuel economy labels by:

- conducting independent testing on about 15% of vehicle models each year on pre-production vehicles provided by manufacturers
- testing cars and trucks that are already in use to confirm that the fuel economy labels are accurate for production vehicles placed into commerce
- assessing information provided by consumers, consumer groups, and the auto industry to identify models for further testing.

If testing reveals that fuel economy labels are *in*accurate, EPA will require manufacturers to update the MPG label to provide consumers with the best information available. Such was the case for several manufacturers' 2012–2013 vehicle models described in figures F1 – F6 below.

Figure F-1
Ford 2013-2014 Model Year Fuel Economy (FE) Label Changes

Carline	Model	City FE (MPG)			Highway FE (MPG)		
		old	new	change	old	new	change
Fusion	Hybrid	47	42	-5	47	41	-6
C-Max	Hybrid	45	40	-5	40	37	-3
Lincoln	MKZ Hybrid	45	38	-7	45	37	-8
Fusion	Energi Plug-In	44	38	-6	41	36	-5
C-Max	Energi Plug-In	44	38	-6	41	36	-5

Figure F-2
Hyundai 2012 Model Year Fuel Economy Label Changes

Carline	Model	City FE (MPG)			Highway FE (MPG)		
		old	new	change	old	new	change
Accent	1.8 L Automatic	30	28	-2	40	37	-3
	1.8 L Manual	30	28	-2	40	37	-3
Azera	3.3L Automatic	20	20	0	29	28	-1
Elantra	1.8 L Automatic	29	28	-1	40	38	-2
	1.8 L Manual	29	28	-1	40	38	-2
Genesis	5.0 L Automatic	17	17	0	26	25	-1
	4.6 L Automatic	17	16	-1	26	25	-1
	5.0 L R-Spec Automatic	16	16	0	25	25	0
	3.8 L Automatic	19	18	-1	29	28	-1
Sonata	Hybrid	35	34	-1	40	39	-1
Tucson	2.4L Automatic 4wd	21	20	-1	28	27	-1
	2.4L Automatic 2wd	22	21	-1	32	30	-2
	2.4L Manual 4wd	20	19	-1	27	25	-2
	2.4L Manual 2wd	21	20	-1	29	27	-2
	2.0L Automatic 2wd	23	22	-1	31	29	-2
	2.0L Manual 2wd	20	20	0	27	26	-1
Veloster	Automatic	29	27	-2	38	35	-3
	Manual	28	27	-1	40	37	-3

Figure F-3
Hyundai 2013 Model Year Fuel Economy Label Changes

Carline	Model	City FE (MPG)			Highway FE (MPG)		
		old	new	change	old	new	change
Accent	Automatic	30	28	-2	40	37	-3
	Manual	30	28	-2	40	37	-3
Azera	3.3L Automatic	20	20	0	30	29	-1
Elantra	1.8 L Automatic	29	28	-1	40	38	-2
	1.8 L Manual	29	28	-1	40	38	-2
	1.8 L Blue Automatic	30	28	-2	40	38	-2
	1.8 L GT Automatic	28	27	-1	39	37	-2
	1.8 L GT Manual	27	26	-1	39	37	-2
	Elantra Coupe Automatic	28	27	-1	39	37	-2
	Elantra Coupe Manual	29	28	-1	40	38	-2
Genesis	5.0 L R-Spec Automatic	16	16	0	25	25	0
	3.8 L Automatic	19	18	-1	29	28	-1
Santa Fe	2.4 L Sport Automatic 4wd	21	20	-1	28	26	-2
	2.4 L Sport Automatic 2wd	22	21	-1	33	29	-4
	2.0 L Sport Automatic 4wd	20	19	-1	27	24	-3
	2.0 L Sport Automatic 2wd	21	20	-1	31	27	-4
Tucson	2.4L Automatic 4wd	21	20	-1	28	27	-1
	2.4L Automatic 2wd	22	21	-1	32	30	-2
	2.4L Manual 4wd	20	19	-1	27	25	-2
	2.4L Manual 2wd	21	20	-1	29	27	-2
	2.0L Automatic 2wd	23	22	-1	31	29	-2
	2.0L Manual 2wd	20	20	0	27	26	-1
Veloster	Automatic	29	28	-1	40	37	-3
	Manual	28	27	-1	40	37	-3
	Turbo Automatic	25	24	-2	34	31	-3
	Turbo Manual	26	24	-2	38	35	-3

Figure F-4
Kia 2012 Model Year Fuel Economy Label Changes

Carline	Model	City FE (MPG)			Highway FE (MPG)		
		old	new	change	old	new	change
Optima	Hybrid	35	34	-1	40	39	-1
Rio	Automatic	30	28	-2	40	36	-4
	Manual	30	29	-1	40	37	-3
Sorento	2.4 L Automatic 4wd SIDI	21	20	-1	28	26	-2
	2.4 L Automatic 2wd SIDI	22	21	-1	32	30	-2
Soul	1.6 L Soul Eco	29	26	-3	36	31	-5
	1.6 L Soul Automatic	27	25	-2	35	30	-5
	1.6 L Soul Manual	27	25	-2	35	30	-5
	2.0 L Soul Eco	27	24	-3	35	29	-6
	2.0 L Soul Automatic	26	23	-3	34	28	-6
	2.0 L Soul Manual	26	24	-2	34	29	-5
Sportage	2.4 L Automatic 4wd	21	20	-1	28	27	-1
	2.4 L Automatic 2wd	22	21	-1	32	30	-2
	2.4 L Manual 4wd	20	19	-1	27	25	-2
	2.4 L Manual 2wd	21	20	-1	29	27	-2
	2.0 L Automatic 2wd	22	21	-1	29	28	-1
	2.0 L Automatic 4wd	21	20	-1	26	25	-1

Figure F-5
Kia 2013 Model Year Fuel Economy Label Changes

Carline	Model	City FE (MPG)			Highway FE (MPG)		
		old	new	change	old	new	change
Rio	Automatic	30	28	-2	40	36	-4
	Manual	30	29	-1	40	37	-3
	Eco Automatic	31	30	-1	40	36	-4
Sorento	2.4 L Automatic 4wd SIDI	21	20	-1	28	26	-2
	2.4 L Automatic 2wd SIDI	22	21	-1	32	30	-2
Soul	1.6 L Soul Eco	29	26	-3	36	31	-5
	1.6 L Soul Automatic	27	25	-2	35	30	-5
	1.6 L Soul Manual	27	25	-2	35	30	-5
	2.0 L Soul Eco	27	24	-3	35	29	-6
	2.0 L Soul Automatic	26	23	-3	34	28	-6
	2.0 L Soul Manual	26	24	-2	34	29	-5
Sportage	2.4 L Automatic 4wd	21	20	-1	28	27	-1
	2.4 L Automatic 2wd	22	21	-1	32	30	-2
	2.4 L Manual 4wd	20	19	-1	27	25	-2
	2.4 L Manual 2wd	21	20	-1	29	27	-2
	2.0 L Automatic 2wd	22	21	-1	29	28	-1
	2.0 L Automatic 4wd	21	20	-1	26	25	-1

Figure F-6
Mercedes 2013-2014 Model Year Fuel Economy Label Changes

Carline	Model	City FE (MPG)			Highway FE (MPG)		
		old	new	change	old	new	change
C300	4-Matic FFV	20	19	-1	27	26	-1
C300	4-Matic PZEV	20	19	-1	29	28	-1

Highlight 2 – Some Truck Manufacturers Earned Early Greenhouse Gas Emission Reduction Credits

In September 2011, EPA and the National Highway Traffic Safety Administration (NHTSA) for the first time jointly introduced GHG and fuel efficiency standards for model years 2014 through 2018 medium and heavy duty engines and vehicles.

Under the program, manufacturers required to meet the new greenhouse standards had the option to earn early credits in MY2013 which can then be applied to subsequent model years. Figure F-7 on the next page lists those manufacturers who certified products under these early credit provisions.

Figure F-7
MY 2013 Early GHG Credit Engine and Vehicle Manufacturers

Manufacturer Name	Number of Vehicle Families		Total
	Tractor	Vocational	
Daimler Trucks	18	12	30
Navistar	11	10	21
PACCAR	0	5	5
Total	29	27	56

Highlight 3 –Certificates of Conformity Issued by EPA Stabilizes at 4000 Per Year

After a period of rapid growth with the advent of the 1990 Clean Air Act amendments, the number of different vehicle and engine families being sold each year appears to have stabilized at around 4,000 certificates of conformity. EPA issued 2,520 certificates of conformity[1] in 2000, 3,641 in 2007, 3,642 in 2008, 3,927 in 2009, 3,689 in 2010 and 3,962 in 2011. In each of the model years 2012 – 2013, EPA issued about 4,000 certificates. Figure F-8 on the next page summarizes the certificates of conformity issued for model years 2012 and 2013.

[1] A Certificate of Conformity is the document that EPA issues to a manufacturer to certify that a vehicle or engine class conforms to EPA requirements. Every class of engines and vehicles introduced into commerce in the United States must have a Certificate of Conformity. Certificates are valid for only one model year of production.

Figure F-8
Certificates of Conformity by Model Year[2]

Industry Sector	Category	MY 2012	MY 2013
Light-Duty Vehicles	Passenger cars and trucks	486	486
	Independent commercial importers	7	15
	Alternative fuel conversions	140	117
Highway Motorcycles	On-highway motorcycles	285	292
Heavy-Duty Highway Engines	Compression ignition (mostly diesel)	55	34
	Spark ignition (mostly gasoline)	29	32
	Alternative fuel conversions	4	1
	Evaporative emissions	12	13
Nonroad Compression Ignition Engines	Diesel powered equipment, such as tractors, generators, construction equipment, forklifts, welders	525	405
	Diesel boats and ships	205	186
	Oceangoing vessels per International Maritime Organization requirements	23	14
	Locomotives	70	79
Nonroad Spark Ignition (SI) Engines	Small SI: Small nonroad gasoline powered equipment, such as lawnmowers, string trimmers, chain saws, small compressors, pumps, utility vehicles < 25 mph, snow blowers, rammers, and floor cleaners	957	924
	Marine SI: Gasoline boats and personal watercraft	146	155
	Large SI: Large nonroad gasoline powered equipment, such as forklifts, compressors, generators, and stationary equipment	149	153
	Evaporative components (mostly intended for small nonroad gasoline and marine gasoline equipment)	679	765
Recreational Vehicles	All-terrain vehicles / Utility vehicles	183	187
	Off-highway motorcycles	56	42
	Snowmobiles	28	30
Total		**4,039**	**3,930**

[2] Most of the information in this report comes from Verify, EPA's Engine and Vehicle Compliance System. Verify, collects emissions and fuel economy compliance information for all types of engines, vehicles, and equipment used in transportation and other mobile source applications. The Verify information system is used by engine and vehicle manufacturers to report this information to EPA.

Highlight 4 – ATV / Motorcycle Certificates Voided

In 2013, after an extensive investigation, EPA voided 153 certificates of conformity for engine families covering more than 170,000 on- and off-highway motorcycles and all-terrain vehicles produced between model years 2005 and 2012. The products were imported or manufactured by the following companies: Snyder Technology, Inc., Snyder Computer Systems, Inc. (doing business as Wildfire Motors Corporation), American Lifan Industry Inc., and Jonway Motorcycles (USA) Co., Ltd. Consumers who own models covered by the voided certificates are not responsible for the wrongdoing and can continue to use their vehicles. Voiding certificates is a key step, potentially leading to EPA enforcement actions against companies holding these certificates for violations of the CAA.

As a result of the August 2014 voiding of certificates of conformity for CF Moto America, Incorporated, the EPA's Office of Enforcement and Compliance Assurance took action that resulted in a civil penalty of $725,000. The settlement also requires CF Moto to institute a recall and fuel tank replacement program, as well as correct emission control labels for nonconforming labels within CF Moto's control. For more information, please see: http://www2.epa.gov//enforcement/cfmoto-powersports-inc-cfmoto-america-inc-zhejiang-cfmoto-power-co-ltd-and-chunfeng

As a result of the October 2013 voiding of certificates of conformity for American Lifan Industry, Incorporated, the EPA's Office of Enforcement and Compliance Assurance took action that resulted in a civil penalty of $630,000 and the posting of a bond of $300,000 to $500,000 to satisfy any Clean Air Act penalty related to future importation of vehicles manufactured by the company in 2014, 2015, and 2016. For more information, please see: http://www2.epa.gov/enforcement/american-lifan-industry-inc-settlement

Highlight 5 –Defect and Recall Requirements Lead to Manufacturers Correcting Potential Problems in Millions of Light Duty Vehicles and Heavy Duty Engines

In calendar years 2012 and 2013 manufacturers recalled approximately 3.7 million cars on the basis of indicators of potential emission problems that were revealed through EPA-mandated surveillance and reporting requirements. Consumers received free repairs, extended warrantees or other remedies to address the emission defects identified in these vehicles. In addition, heavy duty manufacturers recalled more than 340 thousand engines in 2012 and2013.

Figure 1 - Industry Sectors and Examples

Industry Sector	Examples	Key
Light-Duty Vehicles	Passenger cars, vans, SUVs, small trucks	
Highway Motorcycles	On-highway motorcycles, cruisers, choppers, scooters, touring bikes, mopeds, street bikes	
Heavy-Duty Highway Engines	Tractor-trailers (semi-trucks), buses, delivery and work trucks	
Nonroad Compression Ignition Engines (Nonroad CI)	Construction and agricultural equipment, such as tractors, generators, construction and road-work equipment, welders Marine diesel boats and ships, oceangoing vessels Locomotives	
Nonroad Spark Ignition Engines (Nonroad SI)	Small SI: lawnmowers, string trimmers, chain saws, small compressors, pumps, snow blowers Marine SI: inboard and outboard motorboats, jet-skis Large SI: forklifts, large compressors, generators Evaporative components: hoses, fuel tanks	
Recreational Vehicles	All-terrain vehicles (ATVs), utility vehicles (UTVs), sand cars, dune buggies, go karts Off-highway motorcycles Snowmobiles	

II. Scope of EPA's Vehicle, Engine, Equipment, and Fuel Compliance Programs

A. Statutory Authority for EPA Regulation of Vehicles, Engines, Equipment, & Fuels

EPA derives authority to do its work through a variety of environmental statutes enacted by Congress. Figure 1 on the precious page describes all of the industry sectors included in the scope of EPA's Vehicle, Engine, and Equipment Compliance Programs. Figure 2 outlines the primary environmental statutes that give EPA the authority to develop and implement its mobile source clean air programs.[3]

Figure 2 - Environmental Statutes

Statute	Authority
Clean Air Act (CAA)	Emission standards for highway & nonroad vehicles and their fuels
Energy Policy and Conservation Act (EPCA)	Fuel economy information programs for consumers, including vehicle fuel economy labels
Energy Policy Act (EPAct) Energy Independence and Security Act (EISA)	Annual volume standards for renewable fuel content

From locomotives to lawnmowers, EPA's Office of Transportation and Air Quality (OTAQ) has the authority to regulate nearly all engines and vehicles that emit pollutants into the environment. The statutory authority also covers the fuels that power these mobile sources, and includes responsibility for emissions compliance oversight that extends from initial product design to performance on the road and in the field.

B. Scope of EPA Vehicle, Engine, & Equipment Regulations

Compliance programs play an essential role in achieving the benefits of statutes and regulations. OTAQ oversees a comprehensive set of compliance activities to ensure that vehicle and engine manufacturers and fuel refiners and producers satisfy their regulatory obligations.

[3] This report focuses primarily on engines and vehicles even though fuels are also a part of EPA's clean air program. Additional information on the EPA fuels program can be found in Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975-2014 and in RFS2 EMTS Informational Data.

EPA regulation of motor vehicles began in the 1970s; Figure 3 on the next page lists vehicle and engine regulations that were proposed or established since 2004. For a comprehensive list of EPA mobile source emission standards, refer to EPA's online Emission Standards Reference Guide, available at www.epa.gov/otaq/standards/index.htm. Please see Section II.C of this report for a list of regulations applicable to motor vehicle fuels.

Figure 3 - Vehicle and Engine Regulations and Implementation Dates

Affected Industry Sector/Category	Program/Rulemaking Description	Effective Model Year[4]
Light-Duty Vehicles	Tier 2 Emission Standards and Gasoline Sulfur Fuel Control – Strengthened emission standards for light-duty vehicles and significantly reduced sulfur levels in gasoline	2004
	On-Board Diagnostics (OBD) – Established new emissions system monitoring requirements for light-duty diesel vehicles	2005
	Revisions to Motor Vehicle Fuel Economy Labeling – Updated EPA method for determining fuel economy label values to better represent typical driving patterns and more accurately estimate actual consumer fuel economy	2008
	Mobile Source Air Toxics – Set standards to lower gasoline benzene content, reduce cold temperature exhaust emissions, and reduce evaporation and permeation from portable fuel containers	2010
	Clean Alternative Fuel Vehicle and Engine Conversions[5]– Updated anti-tampering provisions applicable to manufacturers of clean alternative fuel conversion systems for highway vehicles and engines	All[6]
	Light-Duty Greenhouse Gas (GHG) Emission Standards – Established the first mobile source emission standards for greenhouse gases including carbon dioxide, methane, and nitrous oxide	2012
	Revisions and Additions to Motor Vehicle Fuel Economy Label – Redesigned label provides new information on vehicle fuel economy, energy use, fuel costs, and environmental impacts for conventional and advanced technology vehicles (including electric vehicles and plug-in hybrid electric vehicles)	2013
	2017 and Later Light-Duty vehicle GHG and Corporate Average Fuel Economy Standards (including revisions to 2012-2016 GHG & CAFE Standards	

[4] Effective model year refers to the first year of a new program. Many programs are phased in over multiple model years.

[5] This rule also applies to heavy-duty highway clean alternative fuel conversions.

[6] Although the regulation took effect with its promulgation in 2011, because it applies to tampering, it applies to any model year that is subject to any emissions standard.

		Control of Air Pollution from Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards	2014

Affected Industry Sector/Category		Program/Rulemaking Description	Effective Model Year
Highway Motorcycles		Highway Motorcycle Exhaust Emissions- Class I and II: Established more stringent HC and added new optional hydrocarbons + oxides of nitrogen (HC+NOx) standards; Added Class 1a (<50cc) Class III: Established new Tier 1 HC+NOx standard Class III: More stringent Tier II HC+NOx standard Highway Motorcycle Permeation Emissions- Established new evaporative/permeation standards for fuel tank(s) and lines.	2006 2006 2010 2008
Heavy-Duty Highway Engines and Vehicles		Light Heavy-Duty OBD – Established OBD monitoring requirements for heavy-duty chassis certified vehicles, and for engines certified for use in heavy-duty vehicles between 8,500 and 14,000 pounds gross vehicle weight rating (GVWR) Heavy-Duty Highway Rule – Established more stringent exhaust emission standards for heavy-duty vehicles and engines; required Ultra Low Sulfur Diesel (ULSD) fuel (15 ppm sulfur maximum) Heavy-Duty Engines OBD Rule – New OBD monitoring requirements for engines certified for use in heavy-duty vehicles above 14,000 pounds GVWR Heavy-Duty GHG Standards – Established first emission standards for greenhouse gas pollutants from heavy-duty engines and heavy-duty vehicles	2004 2007 2010 2014
Nonroad Compression Ignition Engines & Equipment	Construction & Agricultural	Tier 3/Interim Tier 4 – Established more stringent emission standards for engines between 37 and 560 kilowatts (50 and 750 hp) Tier 4 Nonroad Diesel Rule – Established more stringent emissions standards for all engines greater than 19 kilowatts (25 hp) and lowered nonroad diesel fuel sulfur to 15 ppm maximum	2006 2010
	Marine Diesel Engines	Tier 3 and Tier 4 Emission Standards for Marine Diesel Engines – Established more stringent emission standards for newly built and remanufactured engines	2009

	Locomotives	Tier 3 and Tier 4 Emission Standards for Locomotive Diesel Engines – Established more stringent emission standards for newly built and remanufactured engines	2011
Nonroad Spark Ignition Engines & Equipment	Small Spark Ignition Engines (Small SI)	Control of Emissions From Nonroad Spark Ignition Engines and Equipment – Established more stringent exhaust emission standards for Class I (MY2012) and Class II (MY2011) engines below 19 kilowatts and fuel permeation standards for all engines below 19 kilowatts	2011 2012
	Marine Spark Ignition Engines (Marine SI)	Control of Emissions From Nonroad Spark Ignition Engines and Equipment – Established first federal exhaust emission standards for sterndrive and inboard Marine SI engines and increased the stringency of exhaust emission standards for outboard and personal watercraft engines. Established new evaporative emission standards for all Marine SI engines	2010
	Large Spark Ignition Engines (Large SI)	New Emissions Standards for Large SI Engines – Established new emission standards, diagnostic capability and portable emission testing provisions Tier 1 Tier 2	 2004 2007
Recreational Vehicles		New Exhaust Emission Standards for RVs – Off-highway motorcycles, ATVs and UTVs Snowmobiles Tier 1 Tier 2 Tire 3 New permeation standards for fuel components	2006 2006 2010 2012 2008
Aircraft[7]		Control of Air Pollution from Aircraft and Aircraft Engines; Emission Standards and Test Procedures – Established more stringent NOx exhaust emission standards for aircraft engines NOx Emission Standards for Aircraft Gas Turbine Engines – Established new NOx emission standards for aircraft, engines consistent with international standards	2005 2012

C. Scope of EPA Fuel Regulations

In addition to regulating vehicles and engines, EPA regulates motor vehicle fuels, including gasoline, diesel, and renewable fuels such as ethanol and biodiesel. Figure 4 describes both historical and current fuels programs and implementation dates. For a comprehensive list of ongoing fuels regulations, please visit

[7] The Federal Aviation Administration has primary oversight responsibility for aircraft emissions compliance. A general overview can be found at the Federal Aviation Administration Office of Environment and Energy.

http://www.epa.gov/otaq/fuels/publications.htm. Additional information can be found on the OTAQ website at http://www.epa.gov/otaq/fuels/index.htm. Please see Section II.B of this report for recent regulatory actions applicable to vehicles and engines.

Figure 4 - Fuels Regulations and Implementation Dates

Affected Fuel Type- *Applicable Fuel Producer or Importer*	**Program/Rulemaking Description**	**Effective Imple-mentation Date**
Motor vehicle fuels and fuel additives – *Gasoline and diesel refiners and importers, renewable fuel producers and importers, fuel additive producers and importers*	Fuels and Fuel Additives Registration System (FFARS) – Mandatory registration program for motor vehicle gasoline, diesel, and their additives sold in the U.S. Required all fuel and fuel additive manufacturers to report the chemical composition of their products and other technical, sales and health effects information	1975
Gasoline – *Gasoline Refiners and Importers*	Volatility Standards – Limited the vapor pressure of gasoline sold at retail stations during the summer ozone season to reduce evaporative emissions from gasoline, which contribute to ground-level ozone formation	1989
	Oxygenated Fuel Requirements – Established fuel oxygen standards to reduce carbon monoxide emissions from motor vehicles during the winter season	1992
	Reformulated Gasoline (RFG) – Reduced smog-forming and toxic pollutants in U.S. cities with worst smog pollution	1995
	Tier 2 Emission Standards and Gasoline Sulfur Regulations Established stringent exhaust emission standards for all fuel types and limits fuel sulfur levels to an average of 30 ppm	2004
	Mobile Source Air Toxics Regulations – Limited the benzene content of gasoline and reduces toxic emissions from passenger vehicles and gas cans	2011
Diesel – *Diesel Producers and Importers*	Highway, Nonroad, Locomotive, and Marine Regulations – Established suite of rules for highway, nonroad, locomotive, and marine diesel engines that required ultra-low sulfur diesel (ULSD), 15 ppm maximum	2006
	The C3 Marine Rule changed the diesel fuel program to allow production and sale of diesel fuel up to 1000 ppm for Category 3 marine vessels effective June 2010.	2010
	Modifications to the Transmix Provisions under the Diesel Sulfur Program provided relief to transmix processors and pipeline operators to allow the petroleum distribution system to function efficiently effective Feb. 2013.	2013

	Heating Oil Rule expanded the definition of heating oil in the RFS program effective December 2013	2013
Renewable Fuels (e.g. ethanol, biodiesel) – *Gasoline Refiners and Importers, Renewable Fuel Producers, Importers, Exporters, Marketers, and Blenders*	The Renewable Fuel Standard (RFS) – RFS1 – Regulations established under the Energy Policy Act (EPAct) of 2005 required 7.5 billion gallons of renewable fuel to be blended into gasoline by 2012. RFS2 – Regulations established under the Energy Independence and Security Act (EISA) of 2007 expanded upon RFS1. The RFS2 regulations require renewable fuel to be blended into both gasoline and diesel fuel, as well as jet fuel and heating oil. EPA is responsible for publishing annual updates to these renewable fuels standards.	2007 2010

III. Compliance Programs and Processes

A. Overview

EPA uses a variety of testing and reporting programs to monitor compliance with emissions regulations. The programs may apply to vehicles and engines before they are produced (preproduction), while they are in production and after they are in customer service (postproduction). EPA has the authority and flexibility to choose compliance strategies that best fit an industry sector at any given time. Factors that influence the use of a particular compliance approach include regulatory requirements affecting a given industry sector, the technology being used to meet the emission standards, industry-specific production processes and cycles and sector or manufacturer size. This report describes compliance programs and activities that OTAQ conducted in 2012-2013. Specifically, the report presents data we collected and analyzed pertaining to MY 2012-2013 vehicles and engines, as well as test results and other types of information OTAQ obtained during calendar years 2012-2013.

EPA regulations typically give manufacturers some flexibility about how they will achieve emissions compliance. Examples include emissions standard phase-ins, averaging, banking and trading (ABT) programs and several types of exemptions. This regulatory flexibility enables manufacturers to align their business model with emissions requirements and sometimes allow manufacturers to earn credit for introducing new technologies early. At the same time, some regulatory flexibilities introduce challenges to compliance oversight because vehicles and engines subject to one regulation and set of standards may legally certify to different emissions levels. This report includes some discussion of flexibility provisions and presents data showing how manufacturers are using them.

EPA mobile source compliance programs allow for vehicle and engine testing and other compliance activity that can generally be parsed into three life-cycle categories:

Preproduction activities include certification testing and reporting and other compliance processes conducted before vehicles and engines are produced.

Production activities include audits and other compliance testing conducted on vehicles and engines coming off the production line, but before they enter customer service.

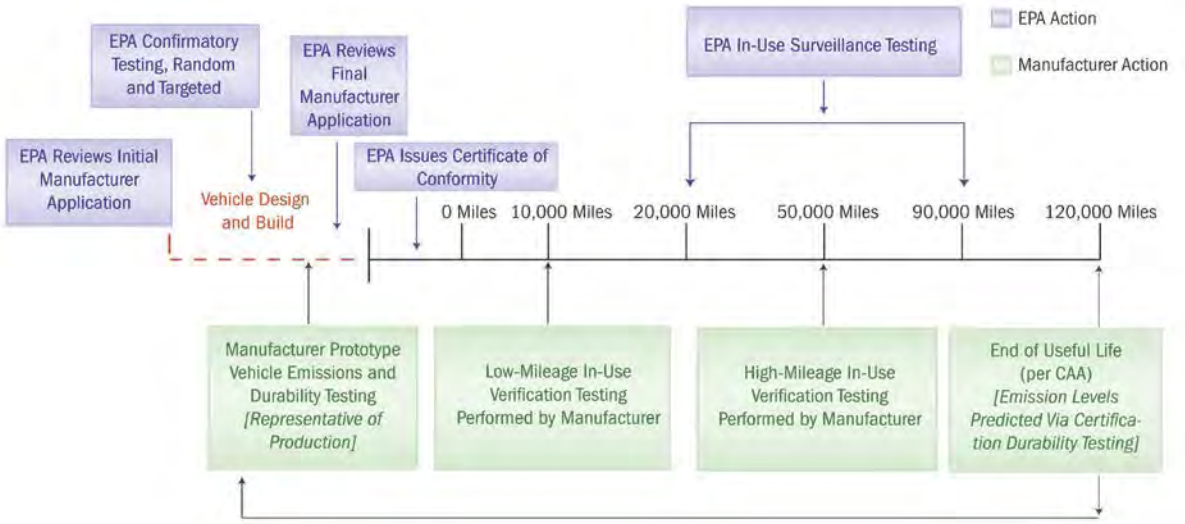
Postproduction activities include in-use testing and reporting and other compliance processes conducted after vehicles and engines enter customer service.

Figure 5 on the next page shows how EPA's compliance programs are related to one another.

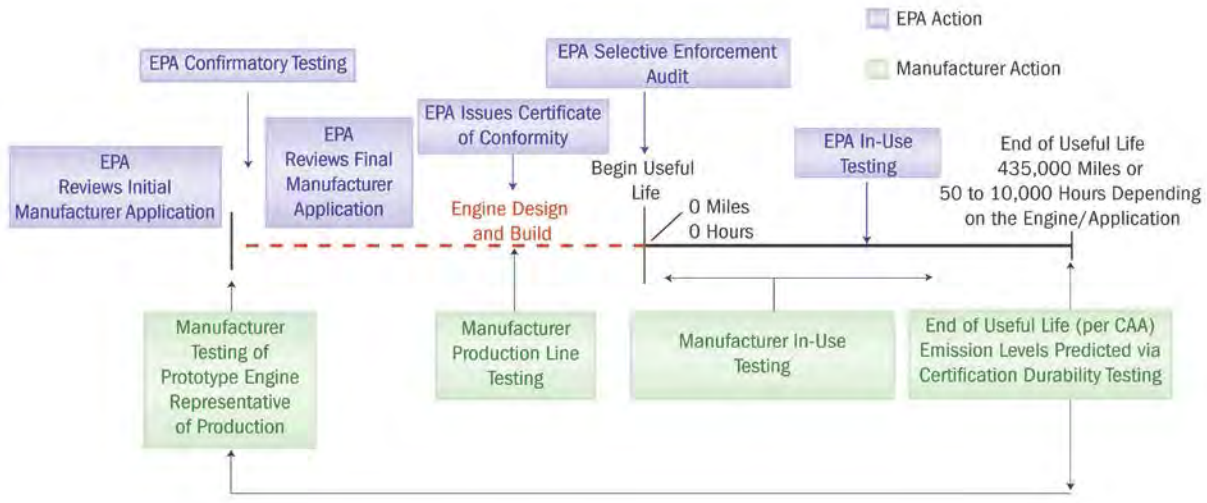
Figure 5 - Compliance Schedule Examples

EPA's mobile source compliance processes seek to ensure that the vehicles and engines are fully compliant with emissions standard throughout their full useful life. This is accomplished with a variety of testing programs and other requirements that occur over the life of vehicles and engines. This figure shows example compliance schedules for certain sectors. Although other mobile source sectors may differ with regard to timing, they generally follow similar protocols.

Compliance Schedule for Light-Duty Vehicles



Compliance Schedule for Certain Heavy-Duty Highway and Nonroad Engines



CERTIFICATES OF CONFORMITY

Section 206 of the Clean Air Act (CAA) requires all engines and vehicles to be covered by a certificate of conformity before they can enter into commerce. A certificate of conformity is a license to produce products for one model year consistent with the vehicle description and any terms of the certificate. Certificates of conformity are generally issued to a group of vehicles or engines having similar design and emission characteristics. For light-duty vehicles, certificates are issued for each unique combination of exhaust test group[8] and evaporative family. For heavy-duty vehicles and nonroad equipment subject to engine standards, the unit of certification is called an engine family. Test groups and engine families may include multiple models. Conversely, different versions within a given model may be included in different engine families or test groups.

Figure 6 on the next page shows the number of certificates that EPA issued in MY 2012-2013.

After a period of rapid growth with the advent of the 1990 Clean Air Act amendments, the number of different vehicle and engine families being sold each year appears to have stabilized at around 4,000. EPA issued 2,520 certificates of conformity[9] in 2000, 3,641 in 2007, 3,642 in 2008, 3,927 in 2009, 3,689 in 2010 and 3,962 in 2011. In each of the model years 2012 – 2013, EPA issued about 4,000 certificates.

[8] An exhaust test group is a group of vehicle models with similar engines, drive trains and emission control systems. It represents a group of vehicles or engines that have a similar design and emission characteristics.

[9] A Certificate of Conformity is the document that EPA issues to a vehicle manufacturer to certify that a vehicle class conforms to EPA requirements. Every class of engines and vehicles introduced into commerce in the United States must have a Certificate of Conformity. Certificates are valid for only one model year of production.

Figure 6 - Certificates of Conformity by Model Year[10]

Industry Sector	Category	MY 2012	MY 2013
Light-Duty Vehicles	Passenger cars and trucks	486	486
	Independent commercial importers	7	15
	Alternative fuel conversions	140	117
Highway Motorcycles	On-highway motorcycles	285	292
Heavy-Duty Highway Engines	Compression ignition (mostly diesel)	55	34
	Spark ignition (mostly gasoline)	29	32
	Alternative fuel conversions	4	1
	Evaporative emissions	12	13
Nonroad Compression Ignition Engines	Diesel powered equipment, such as tractors, generators, construction equipment, forklifts, welders	525	405
	Diesel boats and ships	205	186
	Oceangoing vessels per International Maritime Organization requirements	23	14
	Locomotives	70	79
Nonroad Spark Ignition (SI) Engines	Small SI: Small nonroad gasoline powered equipment, such as lawnmowers, string trimmers, chain saws, small compressors, pumps, utility vehicles < 25 mph, snow blowers, rammers, and floor cleaners	957	924
	Marine SI: Gasoline boats and personal watercraft	146	155
	Large SI: Large nonroad gasoline powered equipment, such as forklifts, compressors, generators, and stationary equipment	149	153
	Evaporative components (mostly intended for small nonroad gasoline and marine gasoline equipment)	679	765
Recreational Vehicles	All-terrain vehicles / Utility vehicles	183	187
	Off-highway motorcycles	56	42
	Snowmobiles	28	30
Total		**4,039**	**3,930**

APPLICATION FOR CERTIFICATION

The certification process begins when a manufacturer submits an application for certification to EPA. Applications cover an exhaust test group or engine family that represents a group of vehicles or engines having similar design and emission characteristics. EPA requires manufacturers to provide detailed information in the certification application to show that the vehicles or engines meet all of the applicable emissions requirements and to describe the vehicles or engines to be covered by the certificate of conformity. Each certificate covers only those vehicles or engines specifically described in the application.

[10] Most of the information in this report comes from Verify, EPA's Engine and Vehicle Compliance System. Verify, collects emissions and fuel economy compliance information for all types of engines, vehicles, and equipment used in transportation and other mobile source applications. The Verify information system is used by engine and vehicle manufacturers to report this information to EPA.

The list below summarizes the general types of information and data that manufacturers submit to begin the application process:

• A description of the basic engine design and list of distinguishable configurations to be covered by the certification application

• An explanation of how the emission control system operates

• A description of the vehicle or engine being used to represent the group for certification testing

• A description of the test procedures and equipment used to test the vehicle or engine

• All emission data obtained on each test vehicle or engine

• The emission deterioration characteristics for each regulated pollutant over the useful life of the vehicles and engines covered by the certification application

• The predicted production volumes of each configuration to be covered by the certificate

• An unconditional statement attesting that vehicles or engines covered by the certification application comply with all requirements of the applicable regulation and the CAA

• Manufacturer representative and official company contact information

• Durability groupings (i.e., groups of vehicles/engines with similar emission deterioration and emission component durability)

• Durability test procedures

• Description of each test group or engine family which is represented by the durability test vehicle or engine

• Description of vehicles or engines used to demonstrate emissions and emission control component durability

• List of all test results, official certification levels, and the applicable emission standards for each vehicle or engine tested

• Statement of compliance with the applicable emission standards for all other configurations not tested but represented by the test vehicles or engine and covered by the certification application

• Evaporative emissions system information

• Description of the evaporative, permeation or refueling families covered by the certification application and test results demonstrating compliance with the applicable standards

• Information on emission control diagnostic systems, where applicable

CONFIRMATORY CERTIFICATION TESTING

Manufacturers conduct the initial testing to support an application for a certificate of conformity and report the results to EPA. Subsequent certification testing, called confirmatory testing, occurs after an application has been submitted. Confirmatory tests are performed by either the manufacturer or by EPA and serve to validate the manufacturer's initial emissions or fuel economy test results.

2. Production Programs

The objective of compliance activities that occur during production is to confirm that vehicles and engines coming off production lines match specifications set forth in the certificate of conformity. In other words, production programs are designed to verify that manufacturers are actually producing the same vehicle or engine that they certified. Some mobile source regulations call for routine production line testing. EPA may also audit production vehicles and engines without prior notice using selective enforcement audits.

3. Postproduction Programs

IN-USE COMPLIANCE PROGRAMS

In-use compliance programs track emissions performance of production vehicles or engines after they enter customer service. In-use testing programs are conducted by both EPA and manufacturers.

DEFECT REPORTING PROGRAMS

Manufacturers are required to report emission-related defects to EPA. An emission-related defect is a defect in design, materials or workmanship in a device, system or assembly, as described in the approved application for certification. Manufacturers must report a defect even if it does not increase emission levels. EPA regulations generally establish minimum numbers of confirmed defects that trigger defect information reporting requirements. An emission-related defect does not necessarily lead to an emission recall because not all defects in emission-related parts increase emissions.

RECALL PROGRAMS

An emissions recall is a repair, adjustment or modification program conducted by a manufacturer to remedy an emission-related problem. Vehicle and engine manufacturers are required to design and build their products to meet emission standards for the useful life of the vehicle or engine specified by law. Under Section 207(c)(1) of the CAA, if EPA determines that a substantial number of vehicles or engines in a category or class do not meet emission standards in actual use, even though they are properly maintained and used, EPA can require the manufacturer to recall and fix the affected vehicles and engines. EPA may use a variety of data sources including EPA and manufacturer test results to determine that a recall is necessary. The purpose of a recall is to help ensure the problem gets fixed and thereby prevent excessive pollution from vehicles or engines that are already in customer service. When an emissions recall occurs, the manufacturer must notify vehicle owners and provide instructions about how to have the vehicle repaired. Most recalls are initiated voluntarily by manufacturers once potential noncompliance is discovered; however, EPA also has the authority to order the manufacturer to recall and fix noncompliant vehicles or engines, if the manufacturer fails to implement a voluntary recall.

4. Regulatory Flexibility Programs

EPA builds flexibility into its emissions regulations to increase compliance efficiency, decrease costs and encourage manufacturers to introduce cleaner technologies sooner.

AVERAGE BANKING AND TRADING (ABT) PROGRAMS

Average Banking and Trading (ABT) provisions allow manufacturers to meet an overall fleet average standard instead of an individual vehicle or engine standard. Manufacturers may comply with ABT provisions by certifying some vehicles and engines at levels above the emission standard, provided that these emission "deficits" are offset by positive credits from vehicles and engines certified below the standard. Compliance is determined by calculating the manufacturer's fleet-wide average of each exhaust test group's production or sales volume and emission level. The flexibility to meet fleet average emission standards by ABT credits can facilitate earlier introduction of clean technology into the market.

TRANSITION PROGRAM FOR EQUIPMENT MANUFACTURERS

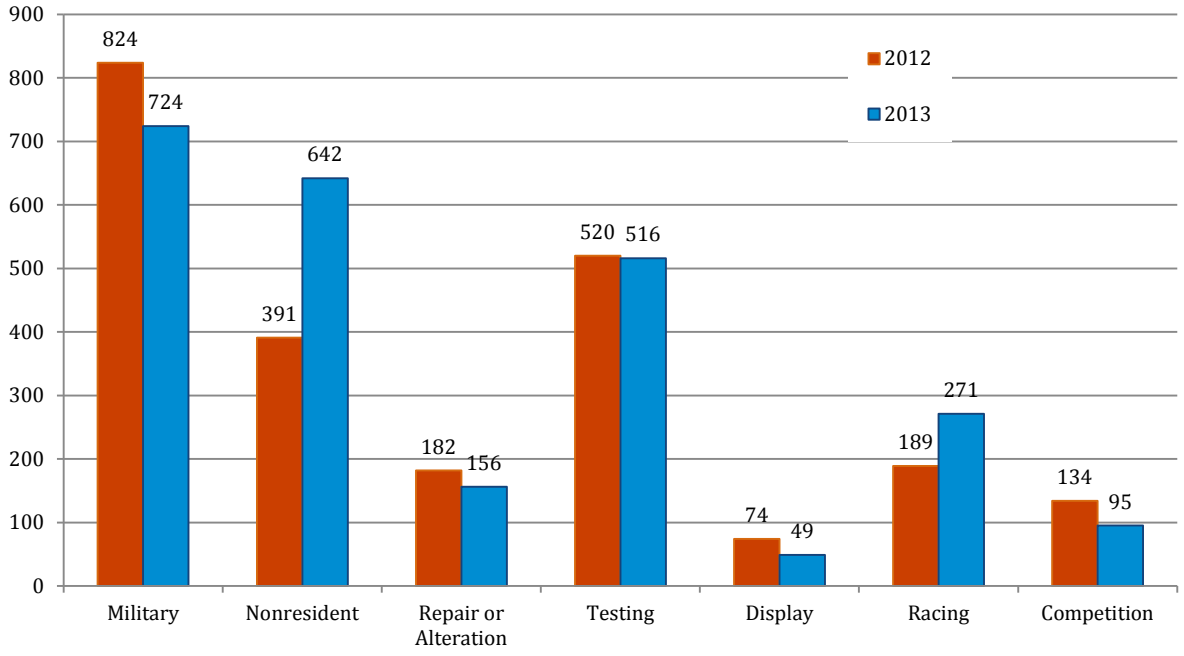
The Transition Program for Equipment Manufacturers (TPEM) recognizes a potential challenge that can face equipment manufacturers when new emission standards take effect. If engines, of which there are relatively few designs, must be redesigned to achieve the required emission reductions, equipment powered by those engines, of which there could be 10,000 or more designs, may also need to be redesigned. TPEM permits equipment manufacturers a transition period during which they may continue to use a limited number of engines meeting previous standards while they update product designs to accommodate engines meeting the new standards.

5. Exemption Programs

Vehicles and engines imported into the United States may be eligible for an exemption from federal emission requirements. For example, vehicles belonging to military personnel or nonresidents may be eligible for exemption. Vehicles that are being imported for testing or display may also be exempt. Depending on the type of exemption, importers must request in advance written EPA approval. EPA works with the Department of Homeland Security U.S. Customs and Border Protection to ensure that proper approvals have been issued before vehicles and engines may enter the United States. The majority of the 2314 import exemptions EPA issued in 2012 and the 2453 exemptions issued in 2013 were for light-duty vehicles. The majority of exemptions EPA issued for heavy-duty highway and nonroad engines or equipment were for test programs. EPA issued 309 heavy-duty or nonroad exemptions in 2012 and 284 in 2013. An exemption may cover multiple vehicles and/or engines.

Figure 7 summarizes the exemptions that EPA issued in calendar years 2012 – 2013.

Figure 7 - Vehicle and Engine Exemptions



B. Light-Duty Vehicles

SECTOR PROFILE:

- The light-duty vehicle sector includes passenger vehicles such as cars, vans, SUVs, and light-trucks
- Light-duty vehicles have been subject to increasingly stringent emissions and fuel economy standards since the 1970s
- Primary emission standards in effect for MY 2012-2013 are Tier 2 emission standards for HC, CO, NOx, and PM and GHG standards for CO_2 and other GHGs

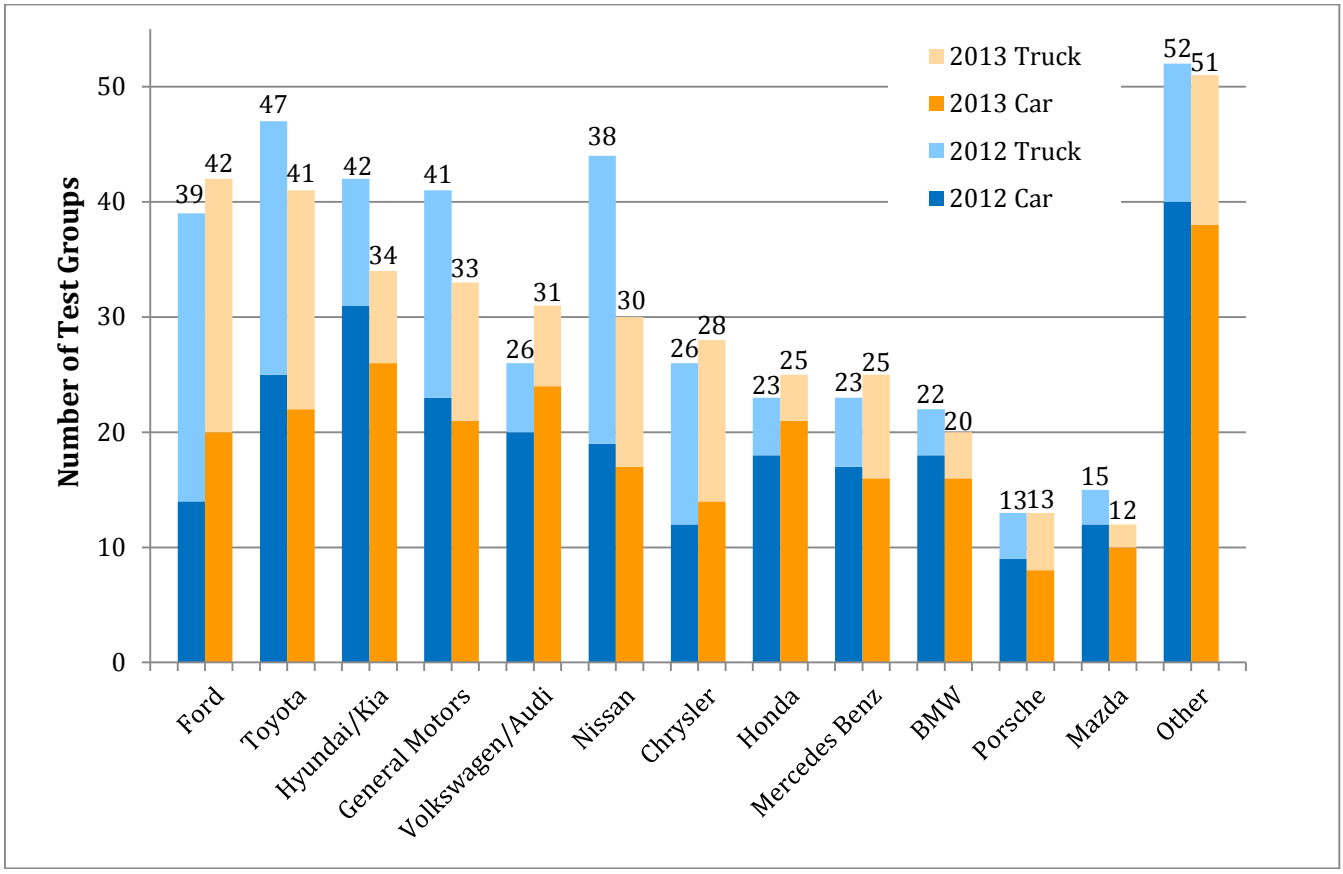
CERTIFICATION

EPA issued 486 certificates to light-duty vehicle[11] original equipment manufacturers (OEMs) each year in MY 2012-2013. Figure 8 shows the number of certified test groups for MY 2012 -2013 by manufacturer.[12], [13]

PRODUCTION VOLUME

Figure 9 on the next page presents by manufacturer the number of MY 2012-2013 cars and light-duty trucks produced for sale in the United States.[14] A comparison of Figures 8 and 9 shows that there is not always a correlation between the number of test groups a manufacturer certifies and the number of vehicles the manufacturer produces. Manufacturers with the most certified test groups do not necessarily produce the most vehicles.

Figure 8 - MY 2012-2013 Light-Duty Vehicle Test Groups by Manufacturer



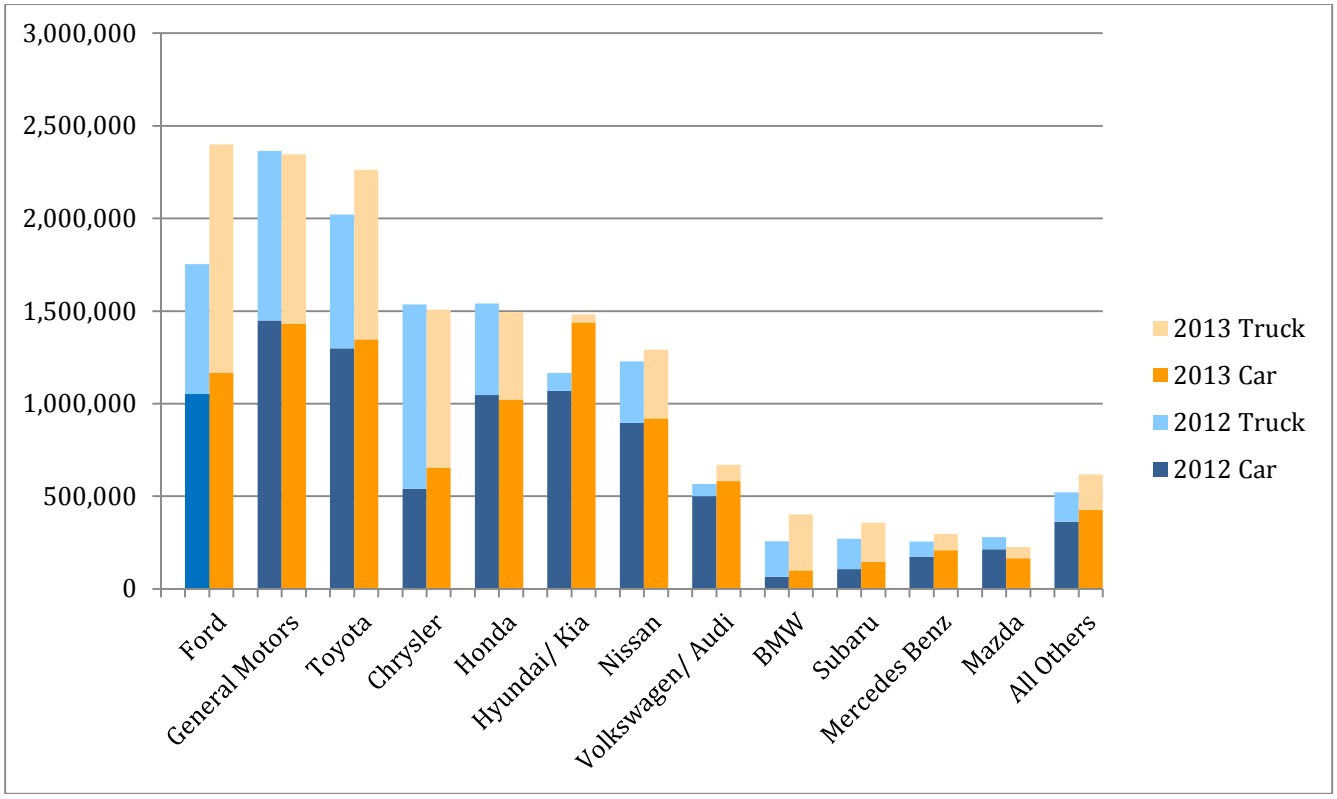
[11] Some heavy-duty vehicles that are between 8,500-14,000 pounds GVWR are chassis-certified and are included in the light-duty vehicle certificate count.

[12] Each light-duty vehicle certificate covers a unique combination of exhaust test group and evaporative emissions family. Therefore the number of light-duty certificates and test groups is usually different. Manufacturers may create test groups that include both cars and trucks.

[13] 'Other' in Figure 8 includes more than 20 manufacturers, each of whom had only a small number of test groups.

[14] These production data only include vehicles subject to Corporate Average Fuel Economy standards.

Figure 9 - MY 2012-2013 Light-Duty Production Volume by Manufacturer[15]



CONFIRMATORY TESTING

EPA and manufacturers test pre-production vehicles and engines prior to their introduction into commerce to confirm initial manufacturer emission test results. When a vehicle fails a confirmatory test, the manufacturer is allowed one retest to confirm or refute the failure. If the vehicle passes on retest, the retest is deemed the official certification test and the results from the retest stand as the official emission levels for that vehicle. Sometimes a confirmatory test failure can be attributed to problems that render the test vehicle unrepresentative of production vehicles. In those situations, the manufacturer corrects the problem in the test vehicle and retests. In still other cases, failures over the confirmatory test reflect actual engineering problems. These types of failures usually result in manufacturer action to change the vehicle calibration and update the certification application accordingly, resulting in a quantifiable emissions reduction for the vehicles that are ultimately produced. Regardless of whether a confirmatory test failure is due to problems with the test vehicle or problems with the calibration, the problems must be corrected and the vehicle must pass confirmatory testing before EPA will issue a certificate.

FUEL ECONOMY TESTING

EPA and manufacturers perform confirmatory testing for both emissions and fuel economy validation. Fuel economy test results are the source for information that appears on new vehicle fuel economy labels

[15] Total annual production for light-duty vehicle manufacturers in 2012 Model Year was over 13.7 million and for 2013 Model Year was over 15.3 million.

and that EPA and the U.S. Department of Transportation use to assess compliance with corporate average fuel economy (CAFE) standards.

EPA reports fuel economy test data in an annual Fuel Economy Trends Report which includes both laboratory test value results and results adjusted for real-world driving conditions.

EPA INVESTIGATION PROMPTS CARMAKERS TO CORRECT INFLATED FUEL ECONOMY CLAIMS

The fuel economy label (the window sticker that appear on new cars) provides consumers with reliable and repeatable estimates of real-world fuel economy for national average drivers and conditions. This allows consumers to compare fuel economy across different car models. EPA requires auto manufacturers to *revise* miles per gallon (MPG) values on fuel economy labels if relevant information becomes available that shows that the original values are too high.

EPA oversees the MPG values on fuel economy labels by:

- conducting independent testing on about 15% of vehicle models each year on pre-production vehicles provided by manufacturers
- testing in-use cars and trucks to confirm that the fuel economy labels are accurate for production vehicles placed into commerce
- assessing information provided by consumer groups, the auto industry and fueleconomy.gov to identify models for further testing.

If testing reveals that fuel economy labels are *in*accurate, EPA will require manufacturers to update the MPG label to provide consumers with the best information available. Such was the case for several manufacturers' 2012–2013 vehicle models described in Figures 10-15 starting on the next page.

As a result of an enforcement action made possible by an OTAQ investigation, automakers Hyundai and Kia will pay a $100 million civil penalty to resolve alleged Clean Air Act violations based on their sale of more than 1 million vehicles that collectively will emit approximately 4.75 million metric tons of greenhouse gases (GHG) in excess of what the automakers certified to the EPA. The companies will forfeit GHG emission credits in order to put the companies in the place they would have been had they accurately reported the GHG emissions from these vehicles in the first place. The companies also will take measures to prevent future violations. On November 3, 2014, the EPA's Office of Enforcement and Compliance Assurance (OECA) and the U.S. Department of Justice (DOJ) announced this settlement, and lodged a consent decree embodying the settlement in the United States District Court for the District of Columbia. The California Air Resources Board joined the United States as a co-plaintiff in this settlement. For more information, please see: http://www2.epa.gov/enforcement/hyundai-and-kia-clean-air-act-settlement

Figure 10
Ford 2013-2014 Model Year Fuel Economy Label Changes

Carline	Model	City FE (MPG)			Highway FE (MPG)		
		old	new	change	old	new	change
Fusion	Hybrid	47	42	-5	47	41	-6
C-Max	Hybrid	45	40	-5	40	37	-3
Lincoln	MKZ Hybrid	45	38	-7	45	37	-8
Fusion	Energi Plug-In	44	38	-6	41	36	-5
C-Max	Energi Plug-In	44	38	-6	41	36	-5

Figure 11
Hyundai 2012 Model Year Fuel Economy Label Changes

Carline	Model	City FE (MPG)			Highway FE (MPG)		
		old	new	change	old	new	change
Accent	1.8 L Automatic	30	28	-2	40	37	-3
	1.8 L Manual	30	28	-2	40	37	-3
Azera	3.3L Automatic	20	20	0	29	28	-1
Elantra	1.8 L Automatic	29	28	-1	40	38	-2
	1.8 L Manual	29	28	-1	40	38	-2
Genesis	5.0 L Automatic	17	17	0	26	25	-1
	4.6 L Automatic	17	16	-1	26	25	-1
	5.0 L R-Spec Automatic	16	16	0	25	25	0
	3.8 L Automatic	19	18	-1	29	28	-1
Sonata	Hybrid	35	34	-1	40	39	-1
Tucson	2.4L Automatic 4wd	21	20	-1	28	27	-1
	2.4L Automatic 2wd	22	21	-1	32	30	-2
	2.4L Manual 4wd	20	19	-1	27	25	-2
	2.4L Manual 2wd	21	20	-1	29	27	-2
	2.0L Automatic 2wd	23	22	-1	31	29	-2
	2.0L Manual 2wd	20	20	0	27	26	-1
Veloster	Automatic	29	27	-2	38	35	-3
	Manual	28	27	-1	40	37	-3

Figure 12
Hyundai 2013 Model Year Fuel Economy Label Changes

Carline	Model	City FE (MPG)			Highway FE (MPG)		
		old	new	change	old	new	change
Accent	Automatic	30	28	-2	40	37	-3
	Manual	30	28	-2	40	37	-3
Azera	3.3L Automatic	20	20	0	30	29	-1
Elantra	1.8 L Automatic	29	28	-1	40	38	-2
	1.8 L Manual	29	28	-1	40	38	-2
	1.8 L Blue Automatic	30	28	-2	40	38	-2
	1.8 L GT Automatic	28	27	-1	39	37	-2
	1.8 L GT Manual	27	26	-1	39	37	-2
	Elantra Coupe Automatic	28	27	-1	39	37	-2
	Elantra Coupe Manual	29	28	-1	40	38	-2
Genesis	5.0 L R-Spec Automatic	16	16	0	25	25	0
	3.8 L Automatic	19	18	-1	29	28	-1
Santa Fe	2.4 L Sport Automatic 4wd	21	20	-1	28	26	-2
	2.4 L Sport Automatic 2wd	22	21	-1	33	29	-4
	2.0 L Sport Automatic 4wd	20	19	-1	27	24	-3
	2.0 L Sport Automatic 2wd	21	20	-1	31	27	-4
Tucson	2.4L Automatic 4wd	21	20	-1	28	27	-1
	2.4L Automatic 2wd	22	21	-1	32	30	-2
	2.4L Manual 4wd	20	19	-1	27	25	-2
	2.4L Manual 2wd	21	20	-1	29	27	-2
	2.0L Automatic 2wd	23	22	-1	31	29	-2
	2.0L Manual 2wd	20	20	0	27	26	-1
Veloster	Automatic	29	28	-1	40	37	-3
	Manual	28	27	-1	40	37	-3
	Turbo Automatic	25	24	-2	34	31	-3
	Turbo Manual	26	24	-2	38	35	-3

Figure 13
Kia 2012 Model Year Fuel Economy Label Changes

Carline	Model	City FE (MPG)			Highway FE (MPG)		
		old	new	change	old	new	change
Optima	Hybrid	35	34	-1	40	39	-1
Rio	Automatic	30	28	-2	40	36	-4
	Manual	30	29	-1	40	37	-3
Sorento	2.4 L Automatic 4wd SIDI	21	20	-1	28	26	-2
	2.4 L Automatic 2wd SIDI	22	21	-1	32	30	-2
Soul	1.6 L Soul Eco	29	26	-3	36	31	-5
	1.6 L Soul Automatic	27	25	-2	35	30	-5
	1.6 L Soul Manual	27	25	-2	35	30	-5
	2.0 L Soul Eco	27	24	-3	35	29	-6
	2.0 L Soul Automatic	26	23	-3	34	28	-6
	2.0 L Soul Manual	26	24	-2	34	29	-5
Sportage	2.4 L Automatic 4wd	21	20	-1	28	27	-1
	2.4 L Automatic 2wd	22	21	-1	32	30	-2
	2.4 L Manual 4wd	20	19	-1	27	25	-2
	2.4 L Manual 2wd	21	20	-1	29	27	-2
	2.0 L Automatic 2wd	22	21	-1	29	28	-1
	2.0 L Automatic 4wd	21	20	-1	26	25	-1

Figure 14
Kia 2013 Model Year Fuel Economy Label Changes

Carline	Model	City FE (MPG)			Highway FE (MPG)		
		old	new	change	old	new	change
Rio	Automatic	30	28	-2	40	36	-4
	Manual	30	29	-1	40	37	-3
	Eco Automatic	31	30	-1	40	36	-4
Sorento	2.4 L Automatic 4wd SIDI	21	20	-1	28	26	-2
	2.4 L Automatic 2wd SIDI	22	21	-1	32	30	-2
Soul	1.6 L Soul Eco	29	26	-3	36	31	-5
	1.6 L Soul Automatic	27	25	-2	35	30	-5
	1.6 L Soul Manual	27	25	-2	35	30	-5
	2.0 L Soul Eco	27	24	-3	35	29	-6
	2.0 L Soul Automatic	26	23	-3	34	28	-6
	2.0 L Soul Manual	26	24	-2	34	29	-5
Sportage	2.4 L Automatic 4wd	21	20	-1	28	27	-1
	2.4 L Automatic 2wd	22	21	-1	32	30	-2
	2.4 L Manual 4wd	20	19	-1	27	25	-2
	2.4 L Manual 2wd	21	20	-1	29	27	-2
	2.0 L Automatic 2wd	22	21	-1	29	28	-1
	2.0 L Automatic 4wd	21	20	-1	26	25	-1

Figure 15
Mercedes 2013-2014 Model Year Fuel Economy Label Changes

Carline	Model	City FE (MPG)			Highway FE (MPG)		
		old	new	change	old	new	change
C300	4-Matic FFV	20	19	-1	27	26	-1
C300	4-Matic PZEV	20	19	-1	29	28	-1

DURABILITY TESTING

The CAA requires EPA emission standards to apply for the full useful life of the vehicle. Since emissions may degrade as vehicles age and accrue miles, manufacturers must perform durability testing to demonstrate that a vehicle will remain compliant for its full useful life, despite any deterioration that may occur over time or distance. EPA regulations establish processes by which manufacturers may demonstrate durability using standard or custom methods. Manufacturers that use their own durability aging procedures must provide EPA with an "equivalency factor" that enables comparison between the proprietary method and the published, standard EPA method. This allows a third party that relies on the EPA method to replicate the manufacturer's method.

IN-USE COMPLIANCE TESTING

Both EPA and manufacturers conduct testing to monitor in-use vehicle emissions. EPA conducts in-use vehicle surveillance testing at the National Vehicle and Fuel Emissions Laboratory in Ann Arbor, Michigan. The purpose of the EPA surveillance program is to assess emissions performance a few years after vehicles enter the fleet. EPA typically recruits two- or three-year-old vehicles from volunteers in southeast Michigan. EPA selects vehicles for surveillance both randomly and based on certification data, manufacturer in-use verification data, vehicle production volume, new technology, and public complaints and inquiries. In CY2012 EPA selected about 33 classes for surveillance and generally tested three vehicles from each selected class. In CY2013 EPA selected 25 classes and tested approximately three vehicles per class. If any of the initial vehicles within a class failed a test, EPA recruited additional vehicles from that class for follow-up testing to determine whether an emissions problem was likely to exist and was not an artifact of the small sample size (or even a single defective vehicle).

EPA also conducts an in-use confirmatory testing program for vehicle classes that merit closer scrutiny. These classes may be identified through failures in either EPA in-use surveillance or manufacturer in-use testing programs.

Figure 16 on the next page shows the vehicle model year, manufacturer, and carline selected for EPA surveillance testing in 2012-2013.

Figure 16 - Vehicles Tested in EPA's In-Use Testing Program in 2012-2013 CYs

Model Year	Manufacturer	Model
Surveillance Classes		
2006	Ford	Taurus
2007	Nissan	Frontier 2WD
2009	Audi	A4 & A5 Audi Quattro
2009	Chrysler	Town & Country, Dodge Caravan
2009	Ford	Mustang
2009	Fuji Subaru	Legacy, Outback, Tribeca
2009	General Motors	Envoy, Trailblazer 2WD
2009	Mazda	6
2010	American Honda	Accord 4DR Sedan
2010	American Honda	Insight
2010	BMW	128, 328, 528; Mini Clubman, Mini Convertible, Mini Cooper
2010	Chrysler	VW Routan; Chrysler Commander 4WD, Jeep Grand Cherokee 4WD; Dodge Caliber; Dodge Nitro, Jeep Liberty; Chrysler 300, 300/SRT-8 Dodge Challenger, Charger
2010	Ford	Transit Connect; Edge FWD; Mercury Grand Marquis FFV
2010	Fuji Subaru	Forester AWD, Impreza AWD, Impreza Wagon/Outback Sport, Legacy Awd
2010	General Motors	GMC Acadia FWD; Chevrolet Camaro; Chevrolet Equinox, GMC Terrain; Chevrolet Impala
2010	GM Daewoo	Chevrolet Aveo, Aveo 5
2010	Honda	Acura TSX
2010	Hyundai	Elantra, Elantra Blue; Genesis; Genesis Coupe; Accent
2010	Kia	Soul; Forte
2010	Land Rover	LR 4, Range Rover, Range Rover Sport
2010	Mazda	3; CX-7 2WD
2010	Mercedes Benz	GL 450 4Matic, GL 550 4Matic
2010	Mitsubishi	Outlander
2010	Nissan	Altima; Frontier, Pathfinder, & Xterra
2010	Toyota	Camry ; Prius; RAV4 2WD
2010	Volkswagen	2.0L Diesel: Golf, Jetta, Jetta Sportwagen
2010	Volvo	Volvo S80, V70, XC60, XC70, XC90
2011	Audi	Volkswagen CC
2011	Chrysler	Jeep Compass & Patriot 4WD
2011	Ford	Escape FWD
2011	General Motors	Cruze; Traverse FWD
2011	Honda	Odyssey 2WD
2011	Kia	Sorento 2WD
2011	Nissan	Sentra
2011	Nissan	Maxima
2011	Toyota	Avalon
2012	Chrysler	Fiat 500
Confirmatory Class		
2006	Ford	Ford Taurus

In addition to its own in-use testing, EPA uses data from the mandatory manufacturer run In-Use Verification Program (IUVP) to monitor in-use light-duty vehicle emissions performance. IUVP tests are required at low mileage (between 10,000 and 50,000 miles) and high mileage (greater than 50,000 miles). Manufacturers must complete low mileage IUVP testing one year after the end of production and complete high mileage IUVP testing five years after the end of production. Figure 17 shows a sample IUVP test schedule for a MY2014 vehicle.

Figure 17 - Example of IUVP Testing Process for a MY 2014 Vehicle

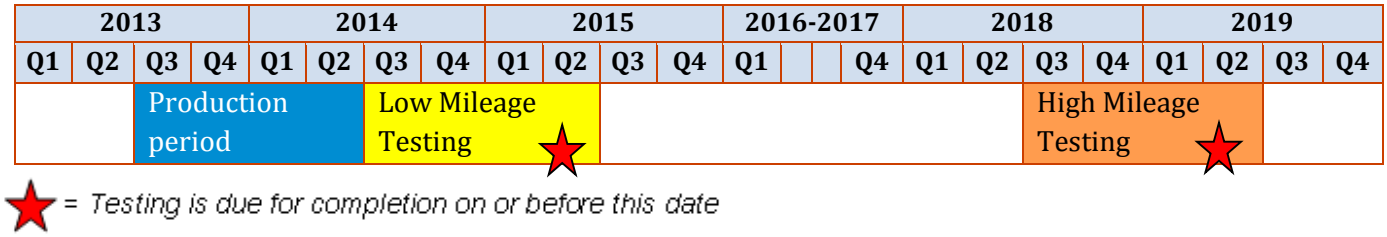


Figure 18 shows the total number of vehicles tested over each test procedure and their corresponding failure rates by vehicle model year for all IUVP testing conducted.

Figure 18
Light-Duty Vehicle In-Use Verification Program Test Volumes and Failure Rates in 2012-2013 CYs

Model Year	FTP		US06		2-Day Evap		ORVR[16]	
	Vehicles Tested	Failure Rate	Vehicles Tested	Failure Rate	Vehicles Tested	Failure Rate	Vehicles Tested	Failure Rate
High-Mileage Testing								
2008	1119	9.0%	783	1.0%	126	6.4%	132	6.8%
2009	654	8.7%	477	0.6%	102	4.9%	94	5.3%
2010	20	10.0%	14	0.0%	5	0.0%	5	0.0%
2011	8	0.0%	7	0.0%	0	0.0%	1	0.0%
2012	5	20.0%	4	0.0%	1	0.0%	0	0.0%
Low-Mileage Testing								
2008	8	0.0%	2	50.0%	1	0.0%	1	0.0%
2009	4	0.0%	3	0.0%	0	0.0%	3	0.0%
2010	12	8.3%	11	0.0%	2	50.0%	4	0.0%
2011	498	3.6%	436	1.2%	131	3.8%	134	3.0%
2012	580	2.8%	520	0.4%	148	2.7%	129	1.6%
2013	73	2.7%	73	0.0%	18	5.6%	15	0.0%

Overall, the test results from this program show that the majority of the in-use fleet continues to comply with the emission standards. However, when IUVP testing identifies potential emissions concerns, EPA and manufacturers work together to implement solutions which may involve voluntary manufacturer action to fix the problem, or, if necessary, an EPA-ordered emissions recall. This process is described in greater detail in the 2007 Compliance Report.

[16] Onboard refueling vapor recovery (ORVR) is a vehicle emission control system that captures fuel vapors from the vehicle gas tank during refueling. This requirement was phased-in from 1998 through 2006.

Figures 19 and 20 present 2012-2013 *calendar year* light-duty vehicle emission defect report information. Defects reported in 2012 -2013 potentially affected more than 48 million vehicles. A single defect incidence may affect multiple *model years* of a given vehicle.

Light-duty vehicle manufacturers are required to notify EPA when they learn of emission-related defects in 25 or more vehicles of the same class (e.g., exhaust test group) and category (e.g., manufacturer and model year).

Figure 19 - 2012-2013 CY Light-Duty Vehicle Defect Reports by Manufacturer

	Reported in CY2012		Reported in CY2013	
Manufacturer	**Number of Defect Reports**	**Number of Affected Vehicles**	**Number of Defect Reports**	**Number of Affected Vehicles**
Audi	16	415,501	10	422,824
Bentley	2	15,893	0	0
BMW	22	520,290	27	943,617
Chrysler	8	514,069	21	5,132,529
Fisker	8	2,753	3	2,835
Ford	7	1,133,253	15	2,136,197
General Motors	14	2,726,536	16	1,030,862
Honda	9	2,216,687	22	14,188,404
Hyundai	0	0	11	5,663,236
Isuzu	0	0	1	4,465
Jaguar	3	9,999	0	0
Jaguar/Land Rover	0	0	2	48,831
Kia	0	0	12	1,716,271
Land Rover	4	49,808	0	0
Lotus	0	0	1	5,476
Mazda	4	203,248	16	1,297,365
Mercedes-Benz	15	230,680	12	325,053
Mitsubishi	1	400	2	30,263
Nissan	19	2,102,476	16	1,616,751
Porsche	19	235,618	15	158,344
Rolls Royce	0	0	1	523
Subaru	6	469,540	2	576,169
Toyota	2	310,800	3	195,800
Volkswagen	10	879,789	8	304,846
Volvo	3	131,268	4	398,627
Total	**172**	**12,168,608**	**220**	**36,199,288**

Figure 19 shows the number of defect reports submitted for each manufacturer in 2012-2013 *calendar years* and the number of affected vehicles. The vehicle *model years* that are covered by the defect reports

submitted in 2012-2013 *calendar years* range from MY 2003 through 2014.[17] Manufacturers are required to report defects up to five years after the end of production.

Figure 20 shows the number of defects by defect category for all the vehicles covered by defect reports in 2012-2013 *calendar years*.

Figure 20 - 2012-2013 CY Light-Duty Vehicle Defect Reports by Problem Category

	Reported in CY2012		Reported in CY2013	
Problem Category	Number of Defect Reports	Number of Affected Vehicles[18]	Number of Defect Reports	Number of Affected Vehicles
Air Inlet/Intake System	7	1,708,931	6	943,866
Catalyst System	3	22,977	8	257,317
Computer Related (other than OBD)	11	639,937	35	6,730,630
Crankcase Ventilation System	5	204,688	1	37,240
Diesel Particulate Filter System	2	108,303	0	0
EGR System	2	225,952	2	104,979
Electrical, Mechanical & Cooling Systems	27	2,400,355	23	3,656,946
Emission Control Information Label	4	47,782	4	46,193
Evap Emissions System	14	1,209,577	19	2,834,713
Exhaust System	6	415,271	5	596,083
Fuel Delivery Component	14	752,429	22	1,260,052
Fuel Delivery System	2	87,120	2	68,132
Fuel Tank System	10	783,198	8	622,631
Hybrid Vehicle System	8	5,184	6	176,757
Ignition System	0	0	8	1,716,819
Monitoring/Measuring Sensor/System	24	2,148,244	12	11,593,222
NOx Absorber System	1	184,167	0	0
NOx Sensor	2	12,014	6	227,618
OBD System	23	1,077,276	32	3,244,916
On-Board Refueling and Vapor Recovery (ORVR)	0	0	1	511,377
Oxygen Sensor	2	9,009	8	1,131,552
Secondary Air System	0	0	2	115,765
Selective Catalytic Reduction System	3	36,545	6	77,944
Turbocharger/Supercharger	2	89,649	4	244,536
Total	**172**	**12,168,608**	**220**	**36,199,288**

[17] Defect and recall reports can be submitted in the calendar year *prior to* the designated model year because vehicles can be certified and introduced into commerce starting January 2 of the prior calendar year. For example, MY 2014 vehicles can be certified and introduced into commerce starting January 2, 2013.

[18] Vehicles that have defects in more than one category are counted in each problem category. Thus, the total number of affected vehicles can be higher in Figure 16 than the total number of affected vehicles in Figure 15.

Figure 21 shows the number of light-duty vehicle recalls by vehicle manufacturer in 2012-2013 *calendar years*. Because a recall usually covers a single, specific condition, a vehicle with multiple emissions problems may be subject to multiple recalls. Thus the total number of affected vehicles includes vehicles that have been recalled more than once. Similarly, there is no direct correlation between the number of defect reports, recalls, and the number of vehicles that are recalled. A manufacturer may identify a lot of defects that are not significant enough to warrant a recall. On the other hand, a manufacturer could have a few major defects that evolve into major recalls affecting large portions of their product line. Historically, emissions recalls affect about three million vehicles annually although the number may vary in any given year.

Figure 21 - 2012-2013 CY Light-Duty Vehicle Recalls by Manufacturer

	Recalls in CY2012		Recalls in CY2013	
Manufacturer	**Number of Recalls**	**Number of Affected Vehicles[18]**	**Number of Recalls**	**Number of Affected Vehicles**
Audi	3	13,106	2	192,037
BMW	4	62,616	1	15,961
Chrysler	7	388,728	7	474,175
Ford	5	220,613	4	663,211
General Motors	4	196,774	2	40,673
Honda	0	0	4	80,290
Lotus	0	0	1	5,476
Mazda	1	3,144	0	0
Nissan	11	470,228	3	11,618
Subaru	1	168,810	1	102,077
Toyota	0	0	2	133,188
Volkswagen	1	167	3	470,533
Total	**37**	**1,524,186**	**30**	**2,189,239**

Figure 22 on the next page lists categories of defects that were corrected by recalls in 2012 – 2013. EPA established the defect categories primarily for internal tracking purposes to identify potential, industry-wide problems with a particular component or technology. Recalls in 2012-2013 *calendar years* affected vehicles spanning 2004 through 2014 *model years*.

Figure 22 - 2012-2013 CY Light-Duty Vehicle Recalls by Problem Category

	Recalls in CY2012		Recalls in CY2013	
Problem Category	Number of Recalls	Number of Affected Vehicles	Number of Recalls	Number of Affected Vehicles
Air Inlet/Intake System	0	0	2	45,773
Computer Related (other than OBD)	6	208,188	8	544,614
EGR System	0	0	1	201,308
Electrical, Mechanical & Cooling Systems	6	247,441	0	0
Emission Control Information Label	3	10,310	2	39,747
Evap Emissions System	1	58,008	2	16,049
Exhaust System	1	225,254	1	102,077
Fuel Delivery Component	3	31,540	4	599,722
Fuel Delivery System	2	79,275	0	0
Fuel Tank System	1	1,739	1	1,789
Hybrid Vehicle System	0	0	2	133,175
Ignition System	1	138,717	0	0
Monitoring/Measuring Sensor/System	2	3,304	2	270.315
NOx Sensor	1	139,790	0	0
OBD System	9	323,986	3	68,023
Oxygen Sensor	0	0	1	935
Secondary Air System	0	0	1	165,712
Turbocharger/Supercharger	1	56,634	0	0
Total	**37**	**1,524,186**	**30**	**2,189,239**

AVERAGING, BANKING AND TRADING (ABT) PROGRAMS

The 2007 Compliance Report provided an overview of EPA's Tier 2 program. The Tier 2 standards are the set of emission standards that applied to cars and light-duty trucks during the period covered by this report.[19] The Tier 2 regulations offer manufacturers a choice of eight emission bins to which they can certify. Lower bin numbers reflect more stringent emission standards. The Tier 2 ABT program allows manufacturers to use sales-weighted averaging to certify groups of vehicles to different bin levels, as long as the fleet as a whole on average meets Bin 5 standards each year.

Figure 23 on the next page shows the percentage of exhaust test groups by emission certification bin for MY 2012-2013. For MY 2012, about 94 percent of test groups were certified to Bin 5 or better. For MY 2013 about 95 percent of test groups were certified to Bin 5 or better.

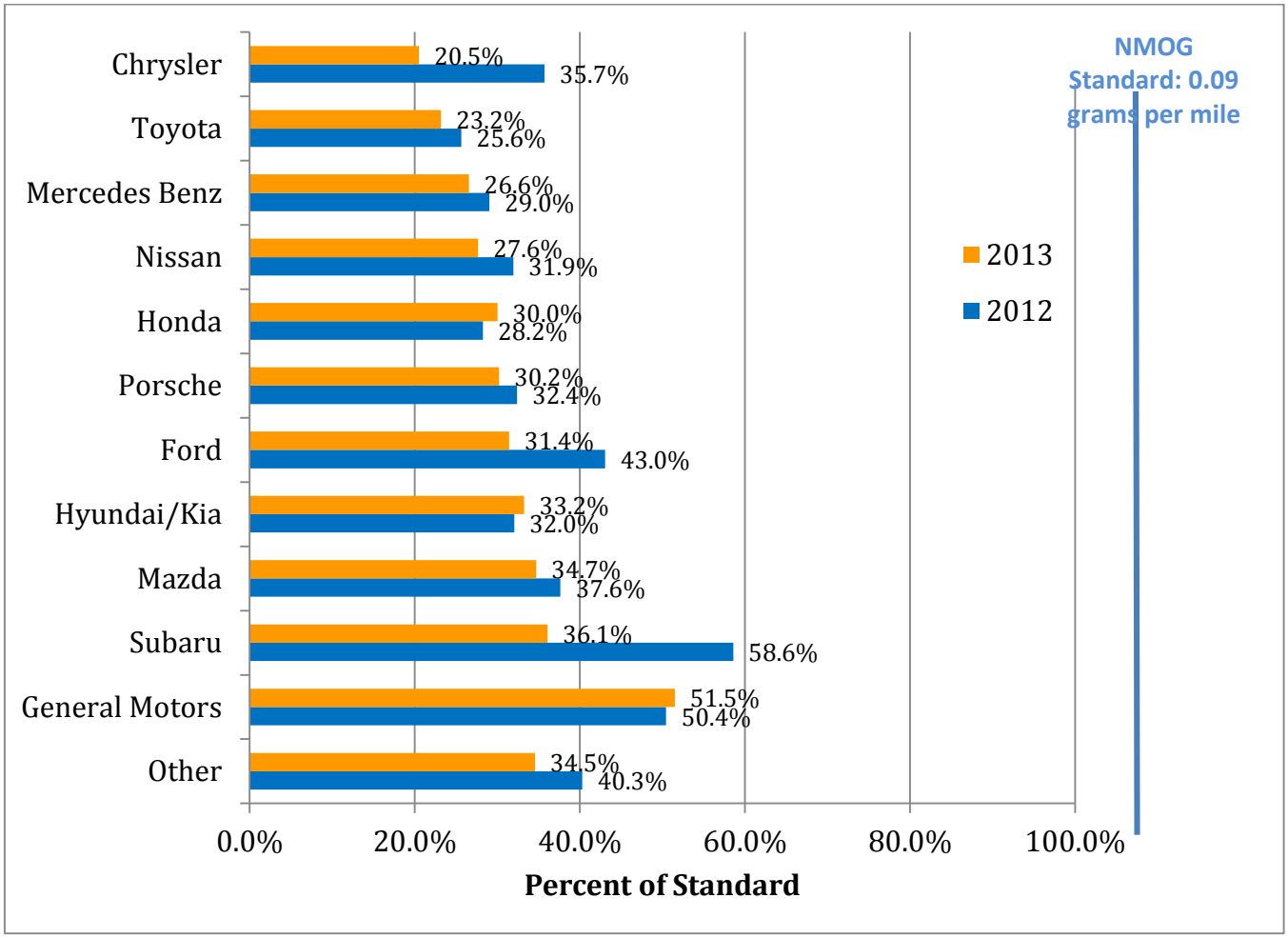
[19] The final Tier 3 standards were published April 28, 2014.

Figure 23
MY 2012-2013 Light-Duty Test Group Distribution by Tier 2 Emissions Bins

	Percentage of Light-Duty Test Groups[20]	
Tier 2 Bin	MY 2012	MY 2013
1	0.2%	0.4%
2	1.0%	2.4%
3	4.0%	4.9%
4	23.1%	26.8%
5	65.5%	60.6%
6	0%	0%
7	0%	0%
8	6.2%	4.9%

Figures 24–26 present the average certification levels for NOx, NMOG, and CO respectively along with the standards for Tier 2 Bin 5 for each major manufacturer for MY 2012-2013. The lower the certification levels relative to the standard, the greater the compliance margin.

Figure 24
MY 2012-2013 Tier 2 Bin 5 NOx Certification Levels and Compliance Margins by Manufacturer



[20] Sum of rounded values may not equal 100 percent.

Figure 25
MY 2012-2013 Tier 2 Bin 5 NMOG Certification Levels and Compliance Margins by Manufacturer

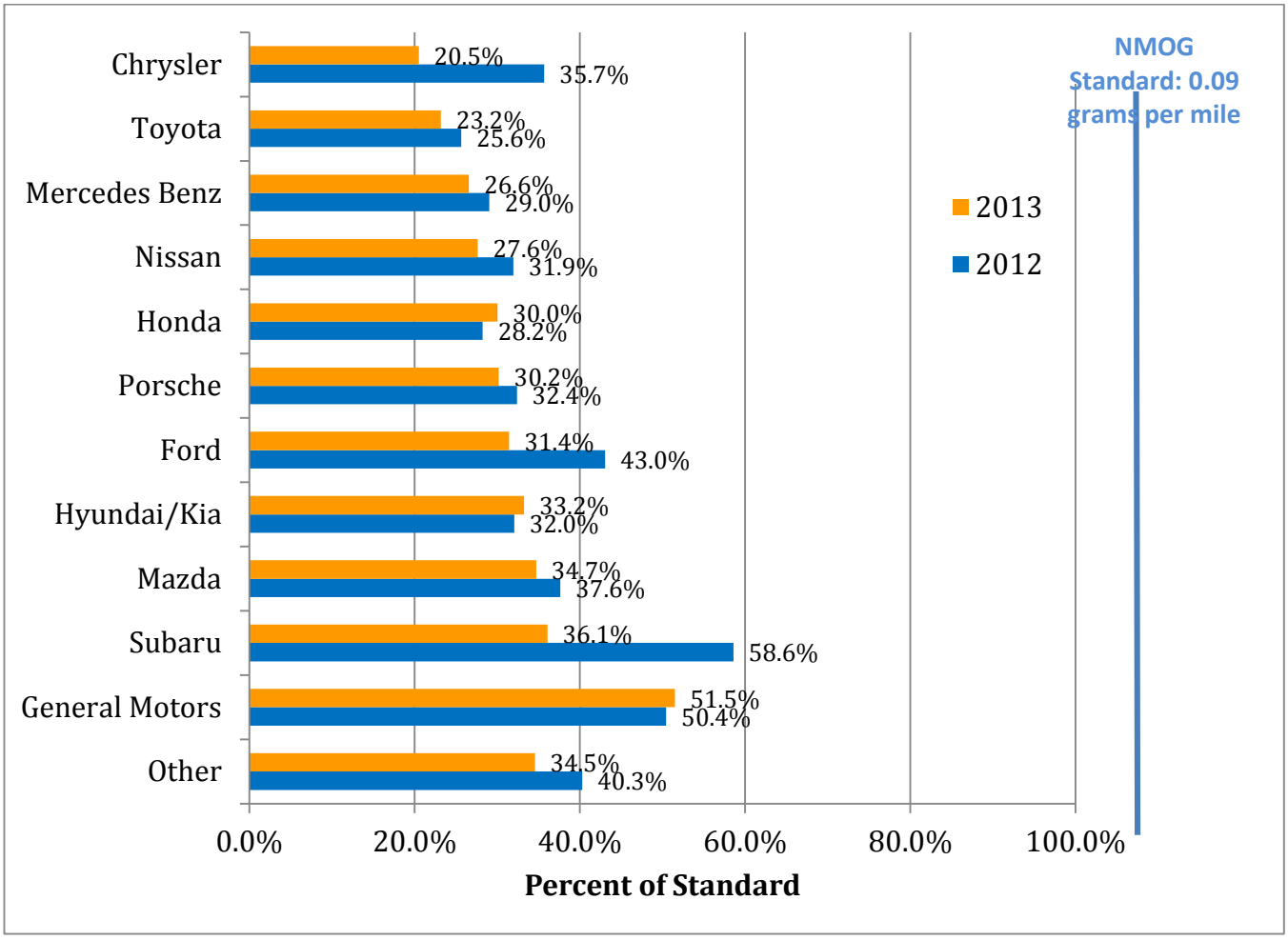
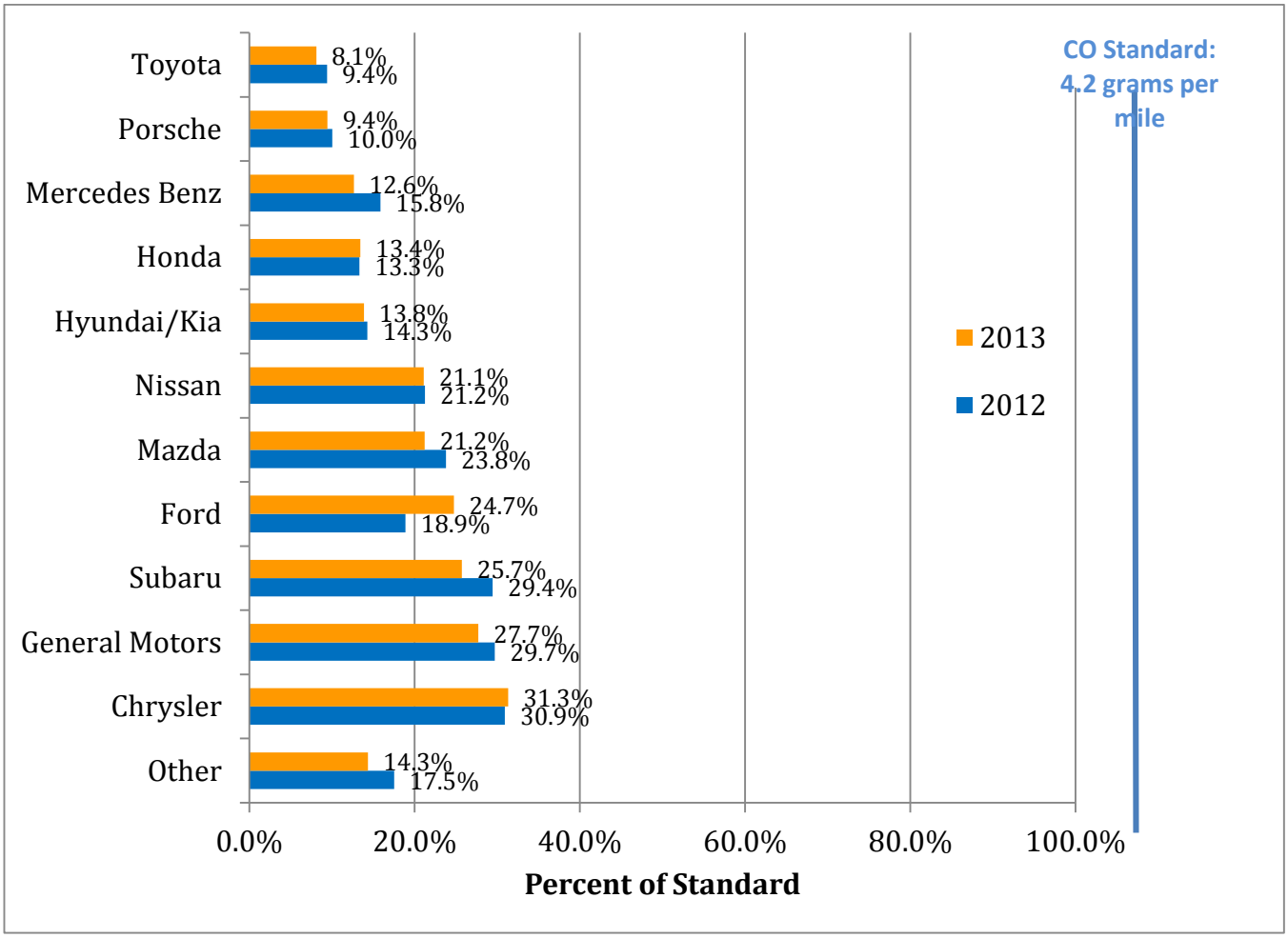


Figure 26
MY 2012-2013 Tier 2 Bin 5 CO Certification Levels and Compliance Margins by Manufacturer



C. Highway Motorcycles

SECTOR PROFILE:

- Highway and off-highway motorcycles are subject to different sets of regulations and emission standards. This section covers the highway motorcycles. Information about off-highway motorcycles is reported in the Recreational Vehicles section
- Highway motorcycles have been subject to HC and CO emissions standards since 1978
- A second set of more stringent emission standards took effect in MY2006. Although the CO emission standard remained unchanged at 12.0 g/km, the HC emission standard was reduced from 5 g/km to 1.0 g/km for Class 1 and 2 motorcycles. In addition, an optional HC + NOx 1.4 g/km standard was added.

CERTIFICATION

Figure 27 presents the number of certified highway motorcycle engine families by class.

Figure 27 - MY 2012-2013 Highway Motorcycle Engine Families by Class

Highway Motorcycle Category	Number of Engine Families	
	MY 2012	MY 2013
Class Ia (<50cc)	42	44
Class Ib (50 -169cc)	54	53
Class II (170-279cc)	44	39
Class III (>279cc)	137	153
Battery electric motorcycles	8	3
Total	**285**	**292**

For MY 2012, 87 manufacturers certified highway motorcycles; 87 manufacturers also certified highway motorcycles in MY 2013. Figure 28 presents the number of motorcycle manufacturers in MY 2012-2013 for each highway motorcycle class.

Figure 28 - MY 2012-2013 Highway Motorcycle Manufacturers by Class

Highway Motorcycle Category	Number of Manufacturers Holding Certificates	
	MY 2012	MY 2013
Class Ia (<50cc)	40	39
Class Ib (50 -169cc)	39	42
Class II (170-279cc)	27	28
Class III (>279cc)	35	36
Battery electric motorcycles	5	3

Figure 29 on the next page presents the number of certified highway motorcycle engine families by manufacturer for MY 2012-2013. The manufacturers that certified a small number of engine families across the two model years are grouped together as “Other”.

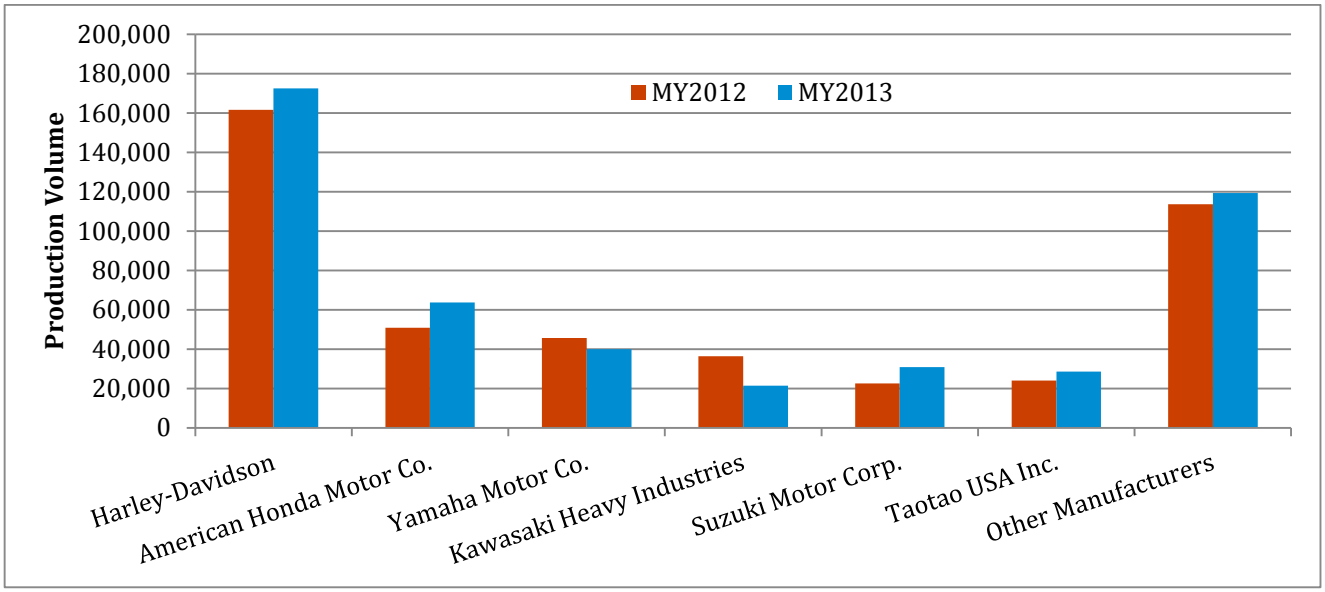
Figure 29 - MY 2012-2013 Highway Motorcycle Engine Families by Manufacturer

MY 2012		MY 2013	
Manufacturer	**Number of Engine Families**	**Manufacturer**	**Number of Engine Families**
Yamaha Motor Corporation	26	Yamaha Motor Corporation	28
American Honda Motor Co., Inc.	15	American Honda Motor Co., Inc.	19
Suzuki Motor Corporation	15	Suzuki Motor Corporation	18
Piaggio Group Americas, Inc.	20	Piaggio Group Americas, Inc.	17
Kawasaki Motors Corp., U.S.A.	15	Kawasaki Motors Corp., U.S.A.	15
KYMCO USA	9	KYMCO USA	12
Ducati North America, Inc.	11	Ducati North America, Inc.	10
Triumph Motorcycles America Ltd	8	Triumph Motorcycles America Ltd	10
BMW	6	BMW	9
Harley-Davidson Motor Company	7	Harley-Davidson Motor Company	7
KTM North America, Inc.	4	KTM North America, Inc.	6
Other	149	Other	141
Total	**285**	**Total**	**292**

PRODUCTION VOLUME

More than 80 highway motorcycle manufacturers certified products in MY 2012 – 2013, but the vast majority of bikes sold in the United States were produced by just a few companies. Figure 30 on the next page shows reported production volumes for the six highest sales volume motorcycle manufacturers in model years 2012-2013. The production volume for lower-volume manufacturers is shown in aggregate. The aggregated volume is based on available data manufacturers have reported to EPA. As with light-duty vehicles, a comparison of Figures 29 and 30 show that there is not always a correlation between the number of engine families a manufacturer certifies and the number of vehicles the manufacturer produces. Manufacturers with the most certified engine families do not necessarily produce the most vehicles.

Figure 30 - MY 2012-2013 Highway Motorcycle Production Volumes by Manufacturer



DEFECT REPORTING

Figure 31 presents 2012-2013 emission defect report information for highway motorcycles. These reports can include multiple model years of a given vehicle and can span more than one problem category. Highway motorcycle manufacturers are required to notify EPA when they learn of the existence of emission-related defects in 25 or more vehicles of the same class (e.g., engine family) and category (e.g., manufacturer, model year).

Figure 31 - 2012-2013 Highway Motorcycle Defect Reports by Problem Category

	Reported in 2012		Reported in 2013	
Problem Category	**Number of Defect Reports**	**Number of Affected Vehicles**	**Number of Defect Reports**	**Number of Affected Vehicles**
Catalytic converter	0	0	1	208
Evaporative canister	0	0	1	615
Engine Control Unit (ECU)	0	0	1	11,097
Fuel related components - Cap	1	273,875	0	0
Total	**1**	**273,875**	**3**	**11,920**

In calendar years 2012-2013, manufacturers submitted defect reports that affected highway motorcycles in model years ranging from MY 2008-2011.

RECALL REPORTING

There was one highway motorcycle recall in 2012 for 273,875 motorcycles with a fuel cap problem. There were three highway motorcycle recalls in 2013 for 11,920 motorcycles with problems categorized as catalytic converter misbuilds, canister defects, and ECU defects.

AVERAGE BANKING AND TRADING (ABT) PROGRAMS

The 2006 regulations added provisions allowing highway motorcycle manufacturers to use an EPA specified emission averaging approach to show compliance with the applicable HC+NOx standards. For MY 2012 – 2013 four manufacturers availed themselves of this provision.

Class III motorcycles (>279cc) represent the majority of motorcycle sales, and many Class III manufacturers with large sales volumes take advantage of the fleet averaging flexibility for HC+NOx. For model year 2012 and model year 2013 over 50 percent of the Class III motorcycle production used the fleet averaging flexibility.

D. HEAVY-DUTY HIGHWAY ENGINES

SECTOR PROFILE:

- Heavy-duty highway engines are used in highway vehicles such as trucks and buses that are more than 8,500 pounds GVWR.
- EPA has regulated heavy-duty highway engine emissions since 1982. Reductions in diesel sulfur content prior to 2007 enabled significant advances in emission controls. Final phase-in of a more stringent NOx standard started in MY2010.
- For MY2012-2013 the primary emission standards in effect were NMHC, CO, NOx and PM.

CERTIFICATION

EPA issued 62 heavy-duty highway certificates for MY 2012 and 39 heavy-duty certificates for MY 2013.[21] These include alternative fuel conversion and evaporative emissions certificates. Most certificates were for diesel engines.

Figures 32 and 33 on the next page present the number of MY 2012-2013 engine families certified in each intended service class for compression ignition and spark ignition heavy-duty highway engines. [22]

[21] Some vehicles that are between 8,500-14,000 pounds GVWR are chassis-certified and are included in the light-duty vehicles data.

[22] The number of engine families is not directly correlated to engine production volumes.

Figure 32
MY 2012-2013 Heavy-Duty Highway Compression Ignition Engine Families by Service Class

Service Class	Number of Engine Families	
	MY 2012	MY 2013
Light heavy-duty diesel	10	8
Medium heavy-duty diesel	15	10
CA only medium-duty	0	0
Heavy heavy-duty diesel	33	18
Urban Bus	3	2
CA only urban bus	1	1

Figure 33
MY 2012-2013 Heavy-Duty Highway Spark Ignition Engine Families by Service Class

Service Class	Number of Engine Families	
	MY 2012	MY 2013
Heavy-duty gasoline 1 (<=14k lbs)	8	8
Heavy-duty gasoline 2 (>14k lbs)	21	24

Figures 34 and 35 present the number of MY 2012-2013 compression ignition and spark ignition engine families by each heavy-duty highway manufacturer.

Figure 34
MY 2012-2013 Heavy-Duty Highway Compression Ignition Engine Families by Manufacturer

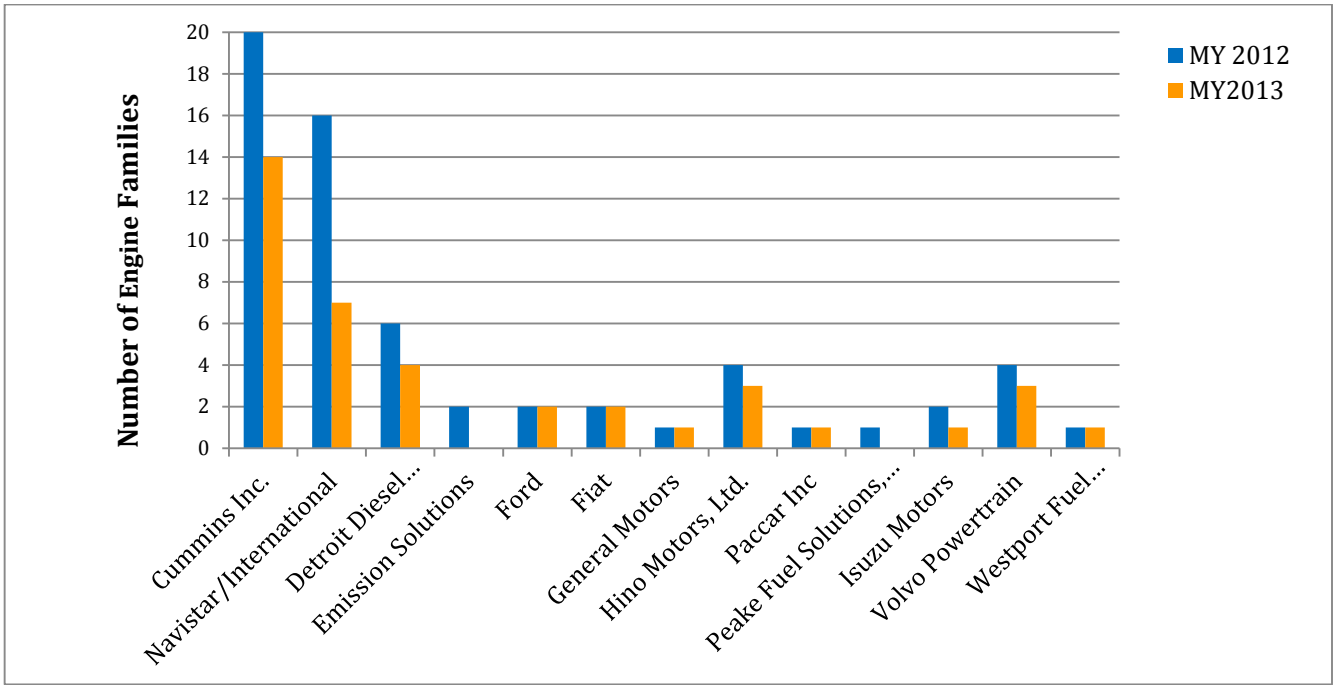
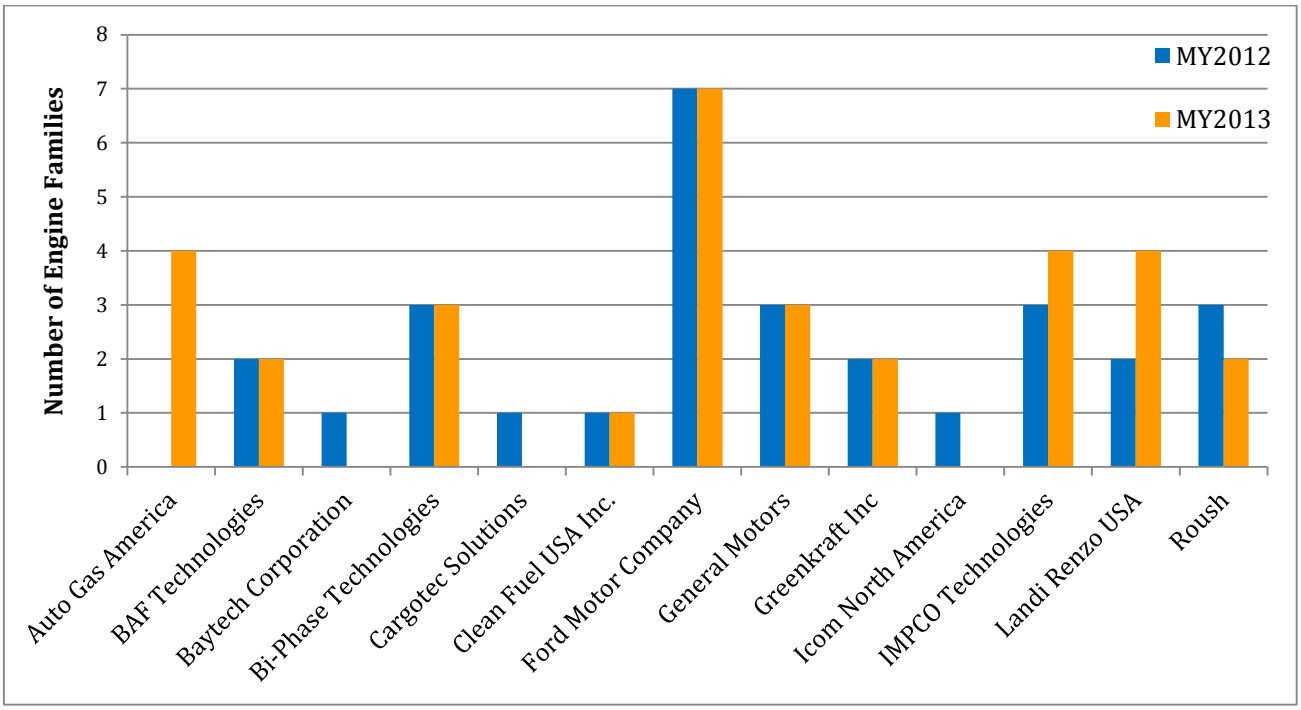


Figure 35
MY 2012-2013 Heavy-Duty Highway Spark Ignition Engine Families by Manufacturer



IN-USE COMPLIANCE TESTING

The in-use compliance testing program assesses emission levels (hydrocarbons, carbon monoxide, nitrogen oxides and particulate matter) from the engines of manufacturers' test fleets or customer-owned in-use heavy-duty diesel trucks using portable emission measurement systems. Portable systems placed inside of the vehicles measure emissions performance during real-world operating conditions. (Previously, engine emission testing involved removing the engine from the truck and testing it in a laboratory on an engine dynamometer.)

Manufacturers monitor compliance by testing in-use diesel engines during normal vehicle operation. If non-complying engines are identified, the manufacturer tests more engines for the purpose of determining if any further action is necessary. EPA also uses the in-use data to make independent evaluations about the possible need to pursue further actions. The in-use test data are used by EPA to assure that emission standards are being met, and by manufacturers to improve their engine designs.

All of the engines tested in this program were found to be in compliance with in-use emission standards when evaluated using the prescribed testing procedures.

DEFECT REPORTING

Figure 36 shows the number of defect information reports heavy-duty highway engine manufacturers submitted in 2012-2013 *calendar years*. Figure 37 shows the number of defect reports manufacturers submitted for each problem category reported in 2012 – 2013 *calendar years*. Defect reports can include multiple model years of a given engine.

Figure 36 - 2012-2013 Heavy-Duty Highway Engine Defect Reports by Manufacturer

Manufacturer	Number of Defect Reports	
	Reported in CY2012	Reported in CY2013
Caterpillar	0	0
Cummins	1	8
Detroit Diesel Corporation	1	4
Ford	0	1
FTP Industrial S.p.A	0	0
General Motors	0	0
Hino	0	11
IVECO S.p.A	0	1
Isuzu	1	2
John Deere	0	0
Navistar	12	5
Paccar	1	4
Roush Industries, Inc.	0	0
UD Trucks Corporation	1	0
Volvo	4	9

Figure 37 - 2012-2013 Heavy-Duty Highway Engine Defect Reports by Problem Category

Problem Category	Number of Defect Reports	
	Reported in CY2012	Reported in CY2013
Fuel delivery component / system	3	4
Turbocharger/supercharger	3	3
Passive diesel particulate filter (DPF)	0	7
Active diesel particulate filter (DPF)	0	7
Electrical, mechanical & cooling systems	0	2
VECI label	3	1
EGR system	5	4
Exhaust system	1	3
Crankcase ventilation component/system	0	0
NOx absorber system	0	0
NOx sensor	1	1
OBD system	0	4
Selective catalytic reduction (SCR) system	3	11
Monitoring/measuring sensor/system	1	0
Computer related (other than OBD)	0	2
Diesel oxidation catalyst (DOC)	1	2
Ignition component	0	0
Defective / Incorrect Catalyst System (non-diesel engine)	0	0
Oxygen sensor	0	0

RECALL REPORTING

Figure 38 shows the number of heavy-duty highway engine recalls issued in 2012-2013 *calendar years*. Figure 39 on the next page shows the number of recalls for each problem category reported in 2012-2013 *calendar years*. Recalls can include multiple model years of a given engine. Recalls in the 2012

calendar year affected engines from 2007 - 2012 *model years*, while recalls in the 2013 *calendar year* affected 2008 - 2013 *model years*.

Figure 38 - 2012-2013 Heavy-Duty Highway Engine Recalls by Manufacturer

	Recalls in CY2012		Recalls in CY2013	
Manufacturer	**Number of Recalls**	**Number of Affected Engines**	**Number of Recalls**	**Number of Affected Engines**
Caterpillar	0	0	0	0
Cummins	0	0	0	0
Detroit Diesel	1	72,399	0	0
Ford	2	196,424	0	0
FPT Industrial S.p.A.	0	0	0	0
General Motors	0	0	0	0
Hino	0	0	9	51,309
Isuzu	1	18,795	0	0
International-Navistar	0	0	0	0
IVECO S.p.A.	1	1,800	0	0
Mitsubishi Fuso Truck	0	0	0	0
PACCAR Inc.	1	31	0	0
Roush Industries, Inc.	0	0	0	0
Volvo	0	0	0	0
Total	**6**	**289,449**	**9**	**51,309**

Figure 39 - 2012-2013 Heavy-Duty Highway Engine Recalls by Problem Category

	Recalls in CY2012		Recalls in CY2013	
Problem Category	**Number of Recalls**	**Number of Affected Engines**	**Number of Recalls**	**Number of Affected Engines**
Crankcase ventilation component/system	0	0	0	0
Active diesel particulate filter (DPF)	0	0	1	16,338
EGR system	0	0	1	2,672
Electrical, mechanical & cooling systems	0	0	0	0
Turbocharger/supercharger	2	17,808	1	4,980
Fuel delivery component	0	0	0	0
Exhaust system	0	0	1	4,980
OBD system	0	0	0	0
VECI label	1	31	0	0
Selective catalytic reduction (SCR) system	2	74,199	4	25,492
Computer related (other than OBD)	0	0	0	0
NOx Sensor	1	139,790	1	4,980
Monitoring/measuring sensor/system	0	0	0	0
Catalyst system	0	0	0	0
Total	**6**	**231,828**	**9**	**59,442**

AVERAGE BANKING AND TRADING (ABT) PROGRAMS

Approximately 30 percent of heavy-duty highway compression ignition engine manufacturers participated in ABT programs in both MYs 2012 and 2013.

MEDIUM AND HEAVY DUTY ENGINES AND VEHICLE GREENHOUSE GAS EMISSIONS

The years 2012 – 2013 marked the beginning of EPA's heavy duty greenhouse gas emission program (GHG) In September 2011, EPA and NHTSA jointly introduced the first ever GHG and fuel efficiency standards for model years 2014 through 2018 medium and heavy duty engines and vehicles.

Under the GHG program manufacturers required to meet the new greenhouse standards have the option to earn early credits in MY2013 which can then be applied to subsequent model years. Figure 40 lists those manufacturers who availed themselves of this opportunity.

Figure 40
MY 2013 Early GHG Credit Engine and Vehicle Manufacturers

Manufacturer Name	Number of Vehicle Families		Total
	Tractor	Vocational	
Daimler Trucks	18	12	30
Navistar	11	10	21
PACCAR	0	5	5
Total	29	27	56

E. NONROAD COMPRESSION IGNITION (NRCI) ENGINES

SECTOR PROFILE-

- EPA regulates several categories of nonroad compression ignition engines including marine diesel engines, locomotives, and compression ignition engines used in construction and agricultural equipment.
- EPA has regulated emissions from nonroad compression ignition engines since 1996.
- Primary emission standards in effect for MY 2012-2013 were NMHC, CO, NOx, and PM.

CERTIFICATION

Figure 41 on the next page presents the number of marine diesel certificates issued by certification tier and classification. Figure 42 on the next page presents the number of marine diesel certificates by manufacturer. Marine diesel engine manufacturers applying for engine certification may request an International Maritime Organization (IMO) certificate in addition to an EPA certificate of conformity for the same engine family. The IMO program, in general, is different from EPA's program, but certain

jurisdictions require operators to display an EPA-issued IMO certificate. For the purposes of this compliance report, only one certificate for each engine family was included in the counts listed below.

New marine diesel standards were phased in at different times for different engine sizes. In general, Tier 2 began to take effect around 2005; Tier 3 began in about 2009. Tier 3 phases in through 2018. Tier 4 begins for some engines in 2014 and will capture all engines *to which it applies* by 2017.

Figure 41 - MY 2012-2013 Marine Diesel Engine Certificates by Tier

Certification Tier	Number of Certificates	
	MY 2012	MY 2013
Tier 1	0	10
Tier 2	141	86
Tier 3	44	82
Remanufacture	18	16
IMO	23	25
Total	**226**	**219**

Figure 42 - MY 2012-2013 Marine Diesel Engine EPA and IMO Certificates by Manufacturer

Manufacturer[23]	Number of Certificates	
	MY 2012	MY 2013
AB Volvo Penta	17	17
Alaska Diesel Electric	4	6
Caterpillar Inc.	28	29
Cummins Inc.	17	15
Detroit Diesel Corporation	5	4
Doosan Engine Co., Ltd.	0	12
Electro-Motive Diesel, Inc.	17	11
FPT Industrials p.A.	13	8
IHI Shibaura Machinery Corporation	11	10
John Deere Power Systems Group	26	24
MAN Nutzfahrzeuge AG	4	5
Marinediesel Sweden AB	6	2
Mitsubishi Heavy Industries, Ltd.	6	5
MTU Detroit Diesel, INC.	4	4
NANNI INDUSTRIES SAS	5	3
Perkins Engines Co Ltd	8	1
Scania-CV AB	6	6
Transportation Systems Business Operations of GE	5	3
Yanmar CO., Ltd	18	11
Other	26	43
Total	**226**	**219**

Figure 43 on the next page shows locomotive certificates. Some engine manufacturers who make engines for locomotives certify those engines to both non-road compression ignition standards and to locomotive standards.

[23] Manufacturers that certified only a few Marine CI engine families in MY 2012 2013 are aggregated under "Other". For MY 2012 "Other" represents 13 manufacturers; for MY 2013 "Other" represents 20 manufacturers.

Figure 43 - MY 2012-2013 Locomotive Certificates by Manufacturer

Manufacturer	MY 2012	MY 2013
Advanced Global Environmental	11	11
Bombardier Transport	1	0
CIT Rail	2	0
CSX Transportation, Inc.	7	8
Cummins Inc.	4	4
Electro-Motive Diesel, Inc. (EMD)	16	16
HK Engine Components LLC	1	1
MotivePower Inc.	1	1
National Railway Equipment Co. (NREC)	5	5
OceanAir Environmental, LLC	3	3
Peaker Services, Inc.	1	2
Progress Rail Services	3	3
RJ Corman Railpower LLC	1	1
Thoroughbred Emissions Research, LLC	0	2
TransPar Corporation	0	0
Transportation Systems Business Operations of General Electric Company (GE)	14	17
Total	**70**	**74**

Nonroad compression ignition engines intended for use in construction and agricultural equipment can be certified for use in one or multiple service classes. Figure 44 presents the number of certificates that were issued covering each power category. As new emission standards became effective for the 2013 model year, the number of engine families certified below 56 kilowatts dropped significantly. Figure 45 on the next page shows the number of engine families certified by each manufacturer for MY 2012 – 2013. The number of certifying engine manufacturers dropped from 67 in MY 2012 to 36 in MY 2013.

Figure 44 - MY 2012-2013 Construction and Agricultural Engine Families by Service Class

Service Class (Power Category)	Number of Engine Families	
	MY 2012	MY 2013
0-8 kW	50	24
8-19 kW	74	62
19-37 kW	106	43
37-56 kW	78	45
56-75 kW	16	14
75-130 kW	42	50
130-560 kW	115	120
>560 kW	44	47
Total[24]	**525**	**405**

[24] This figure does not include stationary-only engine families.

Figure 45 - MY 2012-2013 Construction and Agricultural Engine Families by Manufacturer

Manufacturer[25]	Number of Engine Families	
	MY 2012	MY 2013
Caterpillar (CPX)	35	36
Changchai (CHC)	5	0
Changchai Kaito (CZK)	1	0
Changfa Group (JCG)	1	0
Cummins (CEX)	31	32
Daedong (DCL)	12	4
Deere and Company (JDX)	29	23
Detroit Diesel (DDX)	2	2
Deutz (DZX)	38	33
Daihatsu Motor Company (DHX)	2	0
Doosan (DIC)	5	6
Escorts Limited (AEL)	2	0
FPT Industrial S.p. (FPX)	20	22
Fuzhou Leading Power (FLP)	1	0
Fuzhou Lingli (FZL)	1	0
Greaves Farymann Di (FDU)	4	0
Hailin (FHM)	1	0
Hino (HMX)	4	4
H-Power (WXP)	2	1
Huayuan Laidong (SHL)	6	0
Iseki (ICL)	8	2
ISM (H3X)	23	32
Isuzu (SZX)	14	9
ITC Power (CTE)	1	0
JCB Power Systems (JCB)	1	2
Jiangdong (JDG)	1	0
Jiangsu Changfa Agr (JCA)	1	0
Jiangsu Jin Hongxia (JGH)	2	0
Jindong (SZJ)	1	0
Kapur (FZK)	1	0
Kohler Co. (KHX)	12	4
Komatsu Ltd. (KLX)	10	10
Koop (CKP)	1	0
Kubota (KBX)	43	34
Kukje Machinery (KMC)	9	6
Launtop(FLT)	1	0
Lion (LES)	1	0
Lister Petter Limit (L5X)	4	0
Liebherr Machines Bulle (LHA)	9	10
LS Mtron (LGC)	3	0
M&M (MML)	11	12
Mercedes-Benz (MBX)	4	4
Mitsubishi Fuso (MFT)	2	1
Mitsubishi (MVX)	19	12
Motorenfabrik Hatz (HZX)	25	21

[25] Manufacturers that certified only a few engine families in MY 2012-2013 are aggregated under "Other".

Manufacturer[25]	Number of Engine Families	
	MY 2012	MY 2013
MTU DD (MDD)	7	7
Navistar (NVX)	0	1
Nissan Diesel (NDX)	2	0
Nissan Forklift Co. (NFX)	1	1
Perkins (PKX)	17	17
PSA Peugeot Citroen (PEX)	0	1
Shineray (CSP)	2	0
Simpson & Co Limited (SCL)	4	0
Scania (Y9X)	2	2
Sinopower (FZW)	1	0
Sisu Diesel (SID)	4	4
Suntom (FZS)	1	0
Toyota Industrial Equipment Manufacturing (TIE)	2	0
Volkswagen (VWX)	3	1
Volvo Construction Equipment (VSX)	3	3
AB Volvo Penta (VPX)	11	11
Winsun (NWS)	2	0
World Best Kama (WWB)	3	0
Wuxi Kipor Power Co (WKP)	2	0
Xinchai (ZHX)	2	0
Xingguang (YKX)	1	0
Xingyue(CXG)	1	0
Yangdong (YND)	4	0
Yanmar (YDX)	41	34
Zongshen (CZH)	0	1
Total[26]	**525**	**405**

AVERAGE BANKING AND TRADING (ABT) PROGRAMS

Five construction and agricultural engine manufacturers participated in ABT programs in MY 2012; seven manufacturers participated in MY 2013.

[26] This figure does not include stationary-only engine families.

F. Nonroad Spark Ignition Engines

SECTOR PROFILE:

- Nonroad spark ignition (Nonroad SI) engines are generally divided into three categories for purposes of exhaust emission compliance:
  - Small spark ignition engines (Small SI) are rated below 25 horsepower (19 kW) and are generally used in household and commercial applications, including lawn and garden equipment, utility vehicles, generators, and a variety of other construction, farm, and industrial equipment
  - Marine spark ignition (Marine SI) engines are used in marine vessels, including outboard engines, personal watercraft, and sterndrive/inboard engines
  - Large spark ignition (Large SI) engines are generally rated above 19 kW and used in forklifts, compressors, generators, stationary equipment
- Equipment with NRSI engines installed is also subject to evaporative emissions standards.
- Nonroad SI engines have been subject to emissions regulations since 1997.

CERTIFICATION

For the 2012 – 2013 model years EPA certified more than 900 Small SI engine families, around 150 engine emissions families each for Marine SI and Large SI, and over 650 Evaporative Component families. There are five classes of Small SI engines. Figure 46 presents the number of families certified in each Small SI class.[27] Figures 47-49 on the next page present the number of engine families certified by Small SI, Marine SI, and Large SI. Figure 50 on the next page shows the number of families certified by Evaporative Component type (e.g., fuel tank, and fuel line).

Figure 46 - MY 2012-2013 Small Spark Ignition Engine Families by Class

Small SI Class	Number of Engine Families	
	MY 2012	MY 2013
Class I	216	205
Class II	325	311
Class III	2	1
Class IV	271	257
Class V	143	150
Total	**957**	**924**

[27] Classes are defined by whether or not the engine is applied in a hand held piece of equipment and by power rating. Classes I and II describe non-hand held equipment whereas class III, IV, and V engines are in hand held equipment.

Figure 47 - MY 2012-2013 Small Spark Ignition Engine Families by Manufacturer

Manufacturer	Number of Engine Families	
	MY 2012	MY 2013
Andreas Stihl AG & Co KG	57	55
Echo Incorporated/Kioritz Corporation	54	57
Briggs & Stratton Corporation	46	44
Husqvarna AB	36	35
Kawasaki Motors Corp., U.S.A.	35	36
American Honda Motor Co., Inc.	26	25
Fuji Heavy Industries	26	23
Kohler Co.	26	28
Loncin Motor Co., Ltd.	25	21
Husqvarna Outdoor Products N.A. Inc.	24	23
Jiangsu Jiangdong Group Co. Ltd.	22	27
Chongqing Zongshen General Power Machinery	21	22
Lifan Industry (Group) Co., Ltd.	21	23
Chongqing Rato Power Co., Ltd.	20	24
Husqvarna Zenoah Co., Ltd.	20	21
Shandong Huasheng Zhongtian Machinery	18	23
Other[28]	480	437
Total	**957**	**924**

[28] For MY 2012 "Other" represents 96 manufacturers that collectively produced 480 Small SI engine families. For MY 2013 "Other" represents 83 manufacturers that collectively produced 437 Small SI engine families.

Figure 48 - MY 2012-2013 Marine Spark Ignition Engine Families by Manufacturer

Manufacturer	Number of Engine Families	
	MY 2012	MY 2013
Mercury Marine	35	34
Yamaha Motor Corporation	23	25
Bombardier Recreational Products, Inc	16	15
American Honda Motor Co., Inc.	11	11
Suzuki Motor Corporation	11	12
Tohatsu Corporation	8	8
Indmar Products Co., Inc.	6	5
Hangzhou Hidea Power Machinery Co., Ltd.	5	5
Suzhou Parsun Power Machine Co., Ltd.	5	5
Volvo Penta of the Americas, LLC	5	7
KEM Equipment, Inc.	4	4
Pleasurecraft Marine Engine Company	3	4
Briggs & Stratton Corporation	2	2
Kawasaki Motors Corp., U.S.A.	2	2
LEHR Incorporated	2	3
Albert Weber Manufacturing, Inc.	1	2
Ilmor Engineering, Inc.	1	4
Other[29]	6	7
Total	**146**	**155**

[29] For MY 2012 "Other" represents six manufacturers that collectively produced six Marine SI engine families. For MY 2013 "Other" represents seven manufacturers that collectively produced seven Marine SI engine families.

Figure 49 - MY 2012-2013 Large Spark Ignition Engine Families by Manufacturer

Manufacturer	Number of Engine Families	
	MY 2012	MY 2013
Generac Power Systems, Inc.	47	43
Power Solutions International, Inc.	13	12
KEM Equipment, Inc.	12	12
Bucks Engines	10	9
Cummins Inc.	8	9
IMPCO Technologies, Inc.	8	8
Power Solutions International	8	8
Zenith Power Products	6	5
Engine Distributors, Inc.	5	3
Woodward, Inc.	5	3
Wisconsin Motors, LLC.	4	4
Nissan Forklift Co., Ltd.	3	0
SRC Power Systems, Inc.	3	3
Kubota Corporation	2	4
Global Component Technologies Corporation	0	3
Guascor Power S.A.U.	0	5
Tognum America, Inc.	0	3
Other[30]	15	19
Total	**149**	**153**

Figure 50
MY 2012-2013 Nonroad Spark Ignition Evaporative Component Families by Type

Manufacturer	Number of Engine Families	
	MY 2012	MY 2013
Fuel Line	108	117
Fuel Tank	183	222
Fuel Cap	10	15
Marine Diurnal	28	30
Handheld Equipment	45	59
Non handheld Equipment	302	318
Marine Vessel	3	4
Total	**679**	**765**

[30] For MY 2012 "Other" represents 13 manufacturers that collectively produced 15 Large SI engine families. For MY 2013 "Other" represents 15 manufacturers that collectively produced 19 Large SI engine families.

PRODUCTION LINE TESTING (PLT)

Production line testing requires manufacturers to routinely test engines as they leave the assembly line to demonstrate that production engines meet emission standards. In the Small SI and Marine SI sectors, most engine manufacturers had at least one engine family subject to PLT.[31] In the Large SI sector, many engine families are not subject to PLT requirements because the projected sales volume is less than 150 units. These engine families are only required to submit production reports. Under the PLT program manufacturers submit emissions data on thousands of production engines across the many engine families certified each year. Based on the data submitted by manufacturers, nearly all engine families demonstrate compliance with the emission requirements of the PLT program. The PLT program has identified a small number of engine families in which manufacturers have had to make production changes to improve the emission performance of their engines.

AVERAGE BANKING AND TRADING (ABT) PROGRAMS

Prior to MY 2010 all types of Small SI engines were averaged together. However, beginning in MY 2010, *handheld* and *non-handheld* engines were averaged separately.

In MY 2012 and MY 2013, about 20 percent of Small SI engine manufacturers participated in the ABT program.

G. RECREATIONAL VEHICLES

SECTOR PROFILE:

- Emissions from recreational vehicles (RVs) were unregulated prior to MY 2006.
- The regulations in 40 CFR part 1051 set the first emissions standards for RV categories, including all-terrain vehicles (ATVs); certain off-road utility vehicles (UTVs) (less than 30 kW, less than 1,000 cc, and maximum speed more than 25 mph); off-highway motorcycles; and snowmobiles. Each recreational vehicle category is subject to an individual set of exhaust emission standards which phase in over several years. Regulated pollutants are HC+NOx and CO.
- All RVs became subject to the same fuel component based permeation emission standards beginning in MY 2008. The regulated pollutant is HC.

[31] PLT requirements do not apply to small volume engine manufacturers.

There were 79 different recreational vehicle manufacturers that certified products in MY 2012-2013. Figure 51 presents RV manufacturers that certified a total of at least five engine families in one or more RV sectors in MY 2012 and/or 2013.[32] Figures 52 - 54 present data for manufacturers that certified MY 2012 and/or 2013 engine families in the ATV and UTV, off-highway motorcycle or snowmobile sectors, respectively.

Figure 51 - MY 2012-2013 Recreational Vehicle Engine Families by Manufacturer

Manufacturer	Number of Engine Families	
	MY 2012	MY 2013
Yamaha Motor Corporation	26	25
Polaris Industries Inc.	21	22
American Honda Motor Co., Inc.	20	20
Bombardier Recreational Products,	20	19
Arctic Cat	19	20
Kawasaki Motors Corp., U.S.A.	12	10
Baja Inc.	11	5
KYMCO USA	10	11
BMS Motorsports, Inc.	6	3
CF Moto Powersports, Inc.	6	7
Deere & Company	6	6
Linhai USA, Inc.	6	4
Suzuki Motor Corporation	6	6
Taotao USA Inc.	6	9
Hisun Motors	5	11
LIL PICK UP INC.	5	4
Other	82	77
Total	**267**	**259**

[32]The number of engine families has no bearing on vehicle production volumes.

Figure 52 - MY 2012-2013 ATV and UTV Engine Families by Manufacturer

Manufacturer	Number of Engine Families	
	MY 2012	MY 2013
Yamaha Motor Corporation	14	13
Polaris Industries Inc.	13	14
Arctic Cat	13	13
American Honda Motor Co., Inc.	11	11
Bombardier Recreational Products, Inc	11	11
KYMCO USA	10	11
Kawasaki Motors Corp., U.S.A.	9	7
CF Moto Powersports, Inc.	6	7
Deere & Company	6	6
Linhai USA, Inc.	6	4
BMS Motorsports, Inc.	6	3
Hisun Motors	5	10
Taotao USA Inc.	5	8
Suzuki Motor Corporation	5	5
LIL PICK UP INC.	5	4
Kandi USA, Inc.	4	4
BV Powersports, LLC	3	4
Shenke USA, Inc.	3	4
High Rev Motorsports, LLC	3	2
Baja Inc.	3	1
XY POWERSPORTS LLC	3	1
U-Storm Power Corporation	0	3
Other	39	41
Total	**183**	**187**

Figure 53 - MY 2012-2013 Off-Highway Motorcycle Engine Families by Manufacturer

Manufacturer	Number of Engine Families	
	MY 2012	MY 2013
American Honda Motor Co., Inc.	9	9
Baja Inc.	8	4
Yamaha Motor Corporation	7	7
XMotos USA, Inc.	4	0
Kawasaki Motors Corp., U.S.A.	3	3
KTM North America, Inc.	3	4
AB Distribution, Inc. dba American Beta	2	2
Apollo Motorsports, Inc.	2	0
Xingyue USA, INC	2	0
Yukon Trail, Inc.	2	0
Apollo Motorsports USA, Inc.	1	2
Maxtrade	1	2
Other	12	9
Total	**56**	**42**

Figure 54 - MY 2012-2013 Snowmobile Engine Families by Manufacturer

Manufacturer	Number of Engine Families	
	MY 2012	MY 2013
Bombardier Recreational Products, Inc.	9	8
Polaris Industries Inc.	8	8
Arctic Cat Inc	6	7
Yamaha Motor Co., LTD.	5	5
HJR	0	1
Richmond Manufacturing Group	0	1
Total	**28**	**30**

As shown in Figure 55, in model years 2012-2013 very few ATV/UTV or off-highway motorcycle manufacturers produced two-stroke engines. However, approximately 50% of the snowmobile engine families were two-stroke engines. This represents a technology shift to four-stroke engines. When the current RV regulations were written, a majority of ATVs sold in the United States and almost all snowmobiles used two-stroke engines (see 67 FR 68262).

Figure 55 - MY 2012-2013 Recreational Vehicle Two-Stroke Engine Families

Category	Percentage of Two Stroke Engine Families	
	MY 2012	MY 2013
ATV/UTV	0.5%	0.5%
Off-Highway Motorcycles	11%	5%
Snowmobiles	50%	47%

In addition, in MY 2012-2013 over 70 percent of ATVs and UTV engine families either employed catalyst or fuel injection technologies, or both, to meet the emission standards.

ATV / MOTORCYCLE CERTIFICATES VOIDED

In 2013 EPA voided certificates covering more than 170,000 on- and off-highway motorcycles and all-terrain vehicles produced in model years between 2005 and 2012. The products were imported or manufactured by the following companies: Snyder Technology, Inc., Snyder Computer Systems, Inc. (doing business as Wildfire Motors Corporation), American Lifan Industry Inc., and Jonway Motorcycles (USA) Co., Ltd. Consumers who own models covered by the voided certificates are not responsible for the wrongdoing and can continue to use their vehicles. Voiding certificates is a key step leading to enforcement actions for violations of the CAA.

As a result of the August 2014 voiding of certificates of conformity for CF Moto America, Incorporated, the EPA's Office of Enforcement and Compliance Assurance took action which resulted in a civil penalty of $725,000. The settlement also requires CF Moto to institute a recall and fuel tank replacement program, as well as correct emission control labels for nonconforming labels within CF Moto's control. For more information, please see: http://www2.epa.gov//enforcement/cfmoto-powersports-inc-cfmoto-america-inc-zhejiang-cfmoto-power-co-ltd-and-chunfeng

As a result of the October 2013 voiding of certificates of conformity for American Lifan Industry, Incorporated, the EPA's Office of Enforcement and Compliance Assurance took action which resulted in a

civil penalty of $630,000 and the posting of a bond of $300,000 to $500,000 to satisfy any Clean Air Act penalty related to future importation of vehicles manufactured by the company in 2014, 2015, and 2016. For more information, please see: http://www2.epa.gov/enforcement/american-lifan-industry-inc-settlement

AVERAGE BANKING AND TRADING (ABT) PROGRAMS

Only a few of the larger ATV, utility vehicle, and off-highway motorcycle manufacturers made use of ABT. On the other hand, almost all snowmobile manufacturers participated in ABT.

IV. Industry Statistics

This section presents additional information that EPA collects in the course of implementing compliance programs.

ALTERNATIVE FUEL AND ALTERNATIVE FUEL CONVERSIONS[33]

Some vehicles and engines are designed to operate on fuels other than gasoline and diesel. Some are manufactured by the OEM to operate on alternative fuels, while others are certified by the OEM to operate on gasoline or diesel fuel and later converted by an aftermarket manufacturer to operate on an alternative fuel. Generally, the CAA prohibits any aftermarket changes to a certified vehicle or engine configuration that could affect emissions, but a regulatory exemption to the prohibition is available in the case of alternative fuel conversions. Each sector has different criteria under which vehicles and engines can be converted to operate on a new fuel. In some sectors fuel conversions are certified using OEM certification provisions.

LIGHT-DUTY VEHICLE ALTERNATIVE FUEL DATA

Figures 56 - 57 on the next page present the production of MY 2012-2013 OEM light-duty vehicles by fuel type. Gasoline vehicles comprise the dominant fuel type, followed by flexible fuel vehicles. After gasoline and ethanol, diesel is the next most prevalent fuel, but still represents only about one percent of passenger car and light-duty truck production. Compressed natural gas (CNG) vehicles make up an even smaller fraction of MY 2012-2013 vehicle production.

[33] While alternative fuels are generally understood to mean non-petroleum alternatives to gasoline and diesel, this section of the report also presents data for diesel-fueled vehicles and engines in the light-duty, motorcycle, and recreational vehicle sectors, sectors that have historically been dominated by gasoline.

Figure 56 - MY 2012 Light-Duty Vehicle Production Volume by Fuel Type [34]

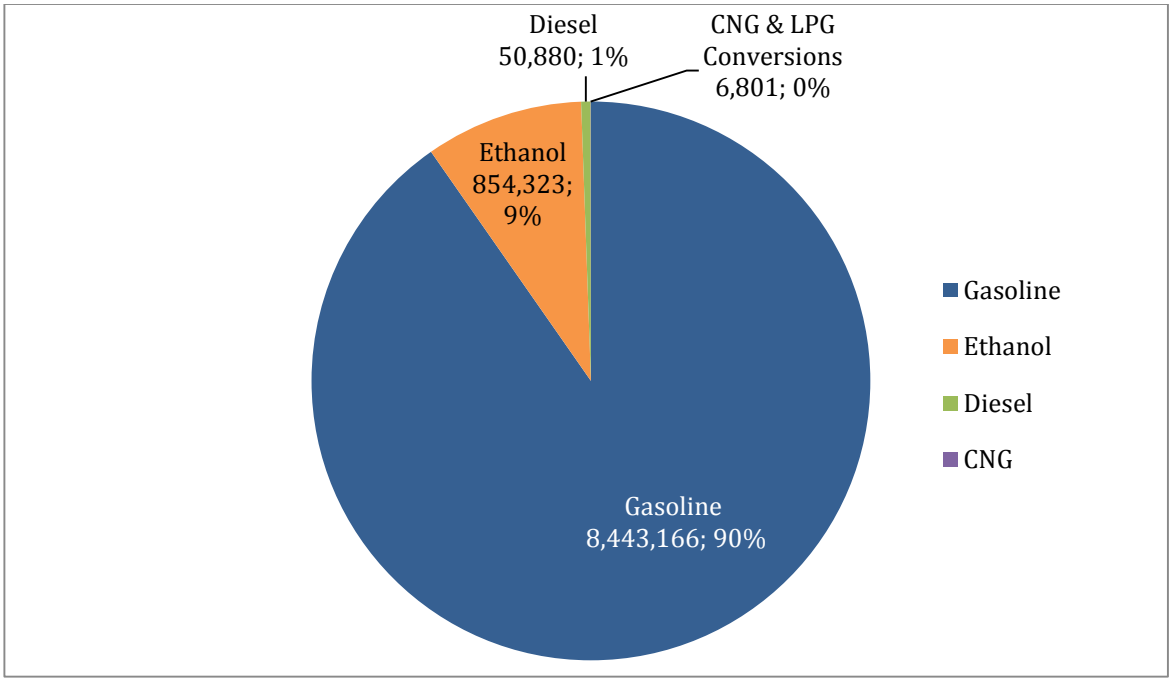
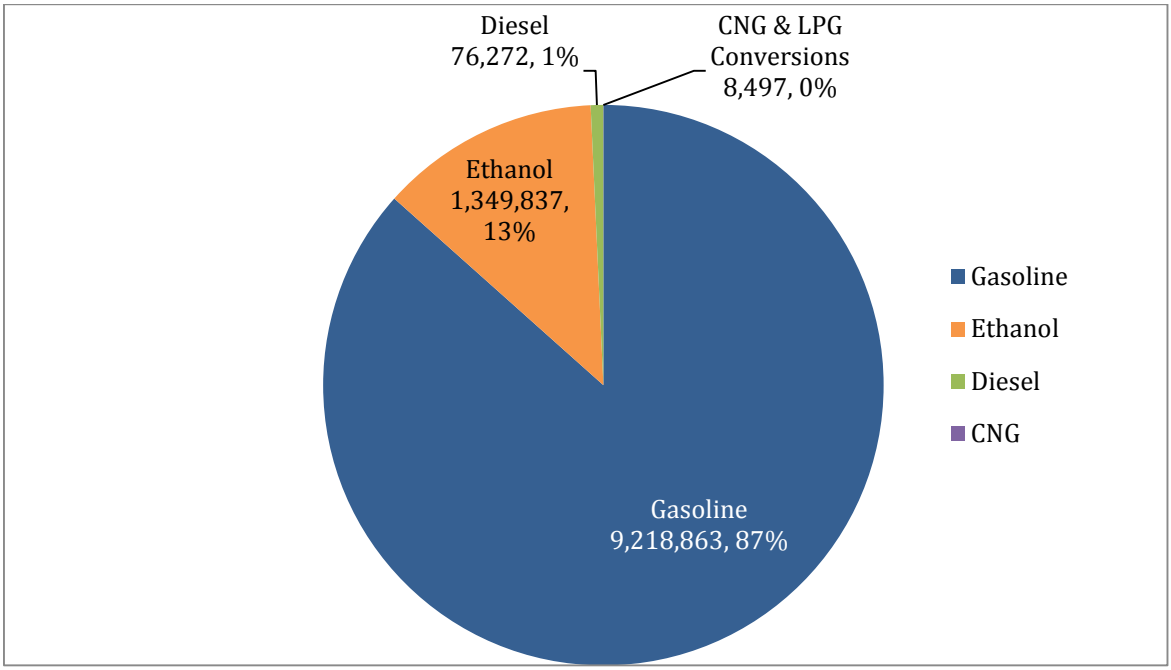


Figure 57 - MY 2013 Light-Duty Vehicle Production Volume by Fuel Type[35]



All MY 2012 – 2013 ethanol vehicles were flexible-fuel vehicles which are capable of operating on gasoline, E85 (85 percent ethanol and 15 percent gasoline), or an intermediate blend.

[34] Ethanol represents ethanol fuel blend of 85% denatured ethanol fuel and 15% gasoline
[35] Ethanol represents ethanol fuel blend of 85% denatured ethanol fuel and 15% gasoline

Figure 58 summarizes the number of OEM light-duty vehicle diesel and alternative fuel test groups by manufacturer.

Figure 58
MY 2012-2013 Light-Duty OEM Diesel and Alternative Fuel Test Groups by Manufacturer

Fuel	Manufacturer	Number of Exhaust Test Groups	
		MY 2012	MY 2013
Battery Electric	Azure Dynamics	1	0
	BYD Motors	1	1
	Coda	1	1
	Nissan	1	1
	Tesla	1	1
	Ford	1	1
	Wheego	0	1
	Toyota	1	2
	Mitsubishi	1	1
	Chrysler Group	0	1
CNG	American Honda	1	1
	Chrysler Group LLC	1	1
	The Vehicle Production Group LLC	1	1
Diesel	Audi	2	3
	BMW	1	1
	Cummins	2	2
	Ford	2	2
	General Motors Inc.	3	3
	Isuzu	1	1
	Mahindra & Mahindra	0	0
	Mercedes Benz	6	8
	Porsche AG	0	1
	Volkswagen	2	2
E85-Gasoline	Amer. Honda	1	0
	Audi	0	2
	Bentley Motors Ltd.	2	2
	Chrysler Group LLC	12	14
	Ford	19	17
	General Motors LLC	22	30
	Jaguar Land Rover Ltd.	0	1
	Mercedes Benz	3	3
	Nissan Motor Co. Ltd	1	1
	SAAB	1	0
	Toyota Motor	1	1
Hydrogen Fuel Cell	American Honda	1	1
	Toyota Mercedes Benz	1	0

Vehicles originally designed and certified to operate on gasoline or diesel fuel can be converted to operate on an alternative fuel. Converters of new vehicles must generally obtain a certificate of conformity to avoid violating the CAA prohibition against tampering.

A regulation finalized in 2011 established alternative pathways to obtain a regulatory exemption from tampering beyond certification for converters of older vehicles and engines (40 CFR part 85, subpart F).

In the light-duty vehicle alternative fuel conversion sector, a total of 18 alternative fuel conversion manufacturers were issued conversion certificates for either the 2012 model year, the 2013 model year or both model year vehicle test groups and thereby received an exemption from the CAA tampering prohibition.

For the 2012 model year light-duty vehicle program, there were 140 conversion certificates issued to alternative fuel conversion manufacturers, 45 conversion postings through the Intermediate Age program which covers vehicles and engines at least two years old but within their regulatory useful life, and no conversion postings through the Outside Useful Life program vehicles and engines that have exceeded their regulatory useful life. For the 2013 model year program, there were 117 conversion certificates issued, 16 conversion postings through the Intermediate Age program and 2 conversion postings through the Outside Useful Life program.

Figure 59 on the next page summarizes the number of certificates issued for light-duty vehicle alternative fuel conversions by alternative fuel type and by manufacturer in MY 2012-2013.[36]

[36] Each light-duty vehicle certificate covers a unique combination of exhaust test group and evaporative emissions family. Therefore the number of light-duty certificates and test groups is usually different. MY 2012-2013 conversion certificates may be issued for conversion of either current or earlier model year OEM vehicles.

Figure 59
MY 2012-2013 Light-Duty Alternative Fuel Conversion Certificates by Manufacturer

Fuel	Manufacturer	Number of Certificates	
		MY 2012	MY 2013
CNG	Altech-Eco	14	6
	BAF Technologies	4	5
	Go Natural CNG	4	0
	Landi-Renzo	1	5
	Nat Gas Car	8	0
	NaturalDrive Partners	3	0
	IMPCO Technologies	5	4
	PowerFuel CNG conversions	0	4
CNG/E85-Gasoline	Altech-Eco	4	0
	The CNG Store; dba Auto Gas	5	1
	BAF Technologies	5	4
	Go Natural CNG	1	0
	Landi-Renzo	3	0
	Nat Gas Car	10	2
	Westport Light-Duty	3	0
	IMPCO Technologies	11	0
	Powerfuel CNG Conversions	0	6
	Altech-ECO	6	5
	The CNG Store; dba Auto Gas	2	3
	BAF Technologies	6	1
	CNG Interstate	0	2
	Westport Light-Duty	0	3
	Land Reno	0	3
	Nat Gas Car	0	10
	IMPCO Technologies	0	10
	M-Tech Solutions	0	1
E85-Gasoline		0	0
LPG	RGR Alternative Fuels	1	0
	Roush Industries	7	4
	ICOM North America	0	2
	Yellow Checker Star	1	1
LPG/E85-Gasoline	American Alternative Fuel	3	0
	IMPCO Technologi	8	0
	ICOM North America	22	8
LPG/Gasoline	American Alternative Fuel	0	6
	Icon North America	0	2
	IMPCO Technologies	3	5
	Blossman Industries	0	12
Plug In Hybrid		0	0

HIGHWAY MOTORCYCLE ALTERNATIVE FUEL DATA

The majority of highway motorcycles are certified to operate on gasoline. However, there are a few highway motorcycle engine families certified to operate as battery-electrics, obtaining energy by charging a battery with electricity from a 120V outlet. See Figure 60 for a breakdown of electric motorcycle manufacturers for MY 2012-2013.

Figure 60
MY 2012-2013 Highway Motorcycle OEM Alternative Fuel Engine Families by Manufacturer

Fuel	Manufacturer	Number of Engine Families	
		MY 2012	MY 2013
Battery Electric[37]	Brammo Inc.	2	0
	Electric Vehicle	1	0
	Hyosung Motors America,	1	0
	Oxygen World, Inc.	1	0
	Zero Motorcycles Inc.	3	0
	Peel Engineering	0	1
	Peraves AG	0	1
	Westward Industries	0	1

HEAVY-DUTY HIGHWAY ALTERNATIVE FUEL DATA

Figure 61 presents the OEM heavy-duty highway engines that were certified to operate on alternative fuels in model years 2012-2013.

Figure 61
MY 2012-2013 Heavy-Duty Highway Engine OEM Alternative Fuel Engine Families by Manufacturer

Fuel	Manufacturer	Number of Engine Families	
		MY 2012	MY 2013
CNG	Cummins Inc.	3	9
	Doosan Infrcore, Co	2	2
	Emission Solutions Inc.	2	-
CNG/Diesel	Westport Fuel Systems	1	1
LPG	Cummins Inc	0	0

[37] EPA began issuing certificates for battery electric highway motorcycles in MY 2009.

Figure 62 shows the heavy-duty highway alternative fuel conversion certificates issued in model years 2012-2013.[38]

Figure 62
MY 2012-2013 Heavy-Duty Highway Engine Alternative Fuel Conversion Certificates by Manufacturer

Fuel	Manufacturer	Number of Certificates	
		MY 2012	MY 2013
CNG	BAF Technologies	1	1
	Baytech Corporation	1	1
	Emission Solutions, Inc.	1	2
	Evotek, LLC	0	0
	Greenkraft, Inc.	2	2
CNG/Gasoline	Baytech Corporation	0	0
	Bi-Phase Technologies, LLC	3	3
	Clean Fuel USA, Inc.	1	1
	Roush	3	2
LPG/Gasoline	Icom North America, LLC	1	0

[38] MY 2012-2013 conversion certificates may be issued for conversion of either current or earlier model year OEM highway engines.

NONROAD SPARK IGNITION ALTERNATIVE FUEL AND FUEL CONVERSION DATA

There are numerous engine manufacturers that certify nonroad spark ignition engines to run on alternative fuels in both the Small SI and the Large SI categories.[39] The following sections detail these two categories.

SMALL SPARK IGNITION ALTERNATIVE FUEL MANUFACTURERS

Figure 63 shows the model years2012 – 2013 small spark ignition engine manufacturers by the type of alternative fuel used.

Figure 63
MY 2012-2013 Alternative Fuel Small SI Engine Manufacturers

Fuel	Manufacturer	Number of Certificates	
		MY 2012	MY 2013
Gasoline – E85	Kohler Co.	0	1
Natural Gas	Aisin World Corp. of America	2	1
	Arrow Engine Company	6	6
	Cummins Power Generation	1	1
	Kubota Corporation	1	1
	Repair Processes, Incorporated	1	1
	Yanmar Co., Ltd.	1	2
	Intellichoice Energy	0	1
Propane	Amano Pioneer Eclipse Corporation	2	1
	Aztec Products Inc.	2	2
	BETCO Corporation	1	1
	Briggs & Stratton Corporation	1	1
	ChongQing AM Pride Power & Machinery Co., Ltd	1	0
	Chongqing Dajiang Power Equipment CO.,LTD	2	0
	Chongqing Hybest Power Products Manufacturing Co., Ltd.	1	1
	Chongqing Maifeng Power Machinery Co., Ltd	1	0
	Chongqing Orbiswork Power Equipment Co., Ltd.	2	0
	Cummins Power Generation	6	4
	Feldmann Eng. & Mfg. Co., Inc.	1	1
	Fuji Heavy Industries	2	1
	Generac Power Systems, Inc.	3	3
	Jiangsu Jiangdong Group Co. Ltd.	2	4
	Kawasaki Motors Corp., U.S.A.	1	1
	Kohler Co.	1	2
	METROLAWN, LLC	6	8
	Nilfisk Advance	2	2
	ONYX ENVIRONMENTAL SOLUTIONS	8	4
	Power Solutions, Inc.	1	0
	Shanghai Grow Development Co., Ltd.	1	1
	Stonekor LLC	2	2
	Tacony Corporation	1	1

[39] Of the marine SI engines certified in MY 2012 and 2013, two MY2012 families were designed to operate on alternative fuels and three MY2013 families were designed to operate on alternative fuels.

	Whitestorm Inc.	1	1
	Yanmar Co., Ltd.	1	2
	Intellichoice Energy	0	1
	Linyi Sanhe Yongjia Power Co.Ltd.	0	1
	Loncin Motor Co. Ltd.	0	2
	Zhejiang Yaofeng Power Technology Co. Ltd.	0	3
Natural Gas / Propane	American Honda Motor Co., Inc.	1	1
	Briggs & Stratton Corporation	7	5
	CHONGQING SANDING GENERAL POWER MACHINERY CO.,LTD	1	1
	Carburetion & Turbo Systems, Inc.	1	1
	Fuji Heavy Industries	1	1
	Generac Power Systems, Inc.	3	5
	Kohler Co.	2	2
	Marathon Engine Systems	1	1
	Shanghai Grow Development Co., Ltd.	2	2
	Chongqing Dajiang Power Equipment CO.LTD	0	2
Propane/Gasoline	Chongqing Dajiang Power Equipment CO.,LTD	2	0
	Chongqing Huansong Industries (Group) Co., Ltd.	1	1
	Chongqing Maifeng Power Machinery Co., Ltd	1	1
	Kubota Corporation	2	2
	Power Solutions International	1	1
	Wenling Jennfeng Industry Inc.	1	1
	Yongkang Xingguang Electrical Manufacture Co., Ltd	2	4
	Yueqing Hejie Electric Co., Ltd	1	3
	Zhejiang Yaofeng Power Technology Co. Ltd.	0	2
Natural Gas / Propane/Gasoline	Winco	1	1
	Chongqing Dajiang Power Equipment CO.LTD	0	2
	CHONGQING SANDING GENERAL POWER MACHINERY CO.LTD	0	2

Figure 64 shows the model years 2012 – 2013 large spark ignition engine manufacturers by the type of alternative fuel used.

Figure 64
MY 2012-2013 Alternative Fuel Large SI Engine Manufacturers

Fuel	Manufacturer	Number of Certificates	
		MY 2012	MY 2013
Natural Gas	GE Jenbacher, Ltd.	1	1
	Industrial Engines Ltd.	2	2
	IMPCO Technologies, Inc.	2	2
	Bucks Engines	6	4
	Cummins Inc.	3	5
	Generac Power Systems, Inc.	27	26
	KEM Equipment, Inc.	1	1
	Power Solutions International	1	1
	Wisconsin Motors, LLC.	1	1
	Guascor Power S.A.U.	0	5
	ENER-G Rudox Inc.	0	1
Natural Gas / Propane	Bucks Engines	1	2
	Cummins Inc.	5	4
	Don Hardy Race Cars, Inc.	1	1
	KEM Equipment, Inc.	5	6
	Origin Engines	1	2
	Power Solutions International, Inc.	8	8
	Power Solutions International	6	6
	SRC Power Systems, Inc.	3	3
	Westport Light Duty Inc.	1	1
	Westport Power Inc.	0	1
	Chongqing Panda Machinery Co., Ltd.	0	2
	Kubota Corporation	0	1
	Dresser, Inc.	0	1
	MTU America, Inc.	0	3
Natural Gas / Propane/ Gasoline	IMPCO Technologies, Inc.	1	1
	Kubota Corporation	1	2
	Engine Distributors, Inc.	3	3
	Power Solutions International, Inc.	2	2
	Toyota Industrial Equipment Manufacturing	1	1
	Zenith Power Products	2	2
Propane	IMPCO Technologies, Inc.	3	3
	Deere & Company	1	1
	Bucks Engines	1	1
	Generac Power Systems, Inc.	20	17
	KEM Equipment, Inc.	2	2
	Kohler Co.	1	1

	Linde Material Handling N.A. Corp.	2	2
	Power Solutions International, Inc.	2	1
	Power Solutions International	1	1
	Woodward, Inc.	2	1
Propane / Gasoline	IMPCO Technologies, Inc.	2	2
	Kubota Corporation	1	1
	Global Component Technologies Corporation	3	3
	Bucks Engines	2	2
	EControls, Inc.	1	0
	Engine Distributors, Inc.	2	0
	KEM Equipment, Inc.	4	3
	Power Solutions International, Inc.	1	1
	Woodward, Inc.	3	2
	Wisconsin Motors, LLC.	1	1
	Zenith Power Products	4	3

About 10 percent of Small SI engine families in MY 2012-2013 were certified to operate on alternative fuels. The majority of Large SI engine families were certified to operate on alternative fuels. In MY 2012 of the 149 Large SI engine families, 144 were certified to operate on one or more alternative fuels. In MY 2013, of the 153 Large SI engines families, 149 were certified to operate on one or more alternative fuels. Figures 65 and 66 summarize information about MY 2012-2013 Small SI and Large SI alternative fuel engine families.

Figure 65
MY 2012-2013 Small Spark Ignition Engine OEM Alternative Fuel Engine Families

Fuel	Number of Engine Families	
	MY 2012	MY 2013
E85-Gasoline	0	1
Natural Gas/CNG	12	13
Natural Gas/CNG / Propane/LPG	19	21
Propane/LPG	53	50
Propane/LPG / Gasoline	12	16
Natural Gas/CNG / Propane/LPG / Gasoline	1	5

Figure 66
MY 2012-2013 Large Spark Ignition Engine OEM Alternative Fuel Engine Families

Fuel	Number of Engine Families	
	MY 2012	MY 2013
Natural Gas/CNG	44	49
Natural Gas/CNG / Propane/LPG	31	41
Natural Gas/CNG / Propane/LPG / Gasoline	10	11
Propane/LPG	35	30
Propane/LPG / Gasoline	24	18

RECREATIONAL VEHICLE ALTERNATIVE FUEL DATA

The majority of recreational vehicles are certified to operate on gasoline. However, there were three ATV engine families certified to operate on diesel in MY 2012 and four in MY 2013. Figure 67 shows a breakdown of diesel recreational vehicle manufacturers.

Figure 67
MY 2012-2013 Recreational Vehicle OEM Diesel Engine Families by Manufacturer

Fuel	Manufacturer	Number of Engine Families	
		MY 2012	MY 2013
Diesel	Tomcar NA Distribution	1	1
	Deere & Company	1	1
	JCB, Inc.	1	1
	Polaris Industries	0	1

MANUFACTURER LOCATIONS

Consistent with past compliance reports, manufacturer locations here are attributed using two different approaches.

For light-duty vehicles and locomotives, data are reported based on where a manufacturer's headquarters are located, not necessarily where the vehicles are manufactured. For example, Toyota's corporate headquarters are in Japan, so all of Toyota's MY 2012-2013 vehicles produced for sale in the United States are presented with Japan listed as the country of origin, even though some Toyota vehicles are built in the United States. For all other sectors, EPA generally reports manufacturer location based on the actual location in which the vehicle or engine was manufactured.

LIGHT-DUTY VEHICLE MANUFACTURER LOCATIONS

Figure 68 on the next page presents the country of origin of MY 2012-2013 light-duty vehicles produced for sale in the United States.[40]

[40] These production data only include vehicles subject to Corporate Average Fuel Economy standards. Pickup trucks greater than 8,500 pounds Gross Vehicle Weight are not included.

Figure 68
MY 2012-2013 Light-Duty Vehicle Production Volume by Manufacturer's Country of Origin

Country	Production Volume	
	MY 2012	MY 2013
USA	5,657,856	6,270,952
Japan	5,433,737	5,691,017
Korea	1,164,920	0
Germany	1,108,916	1,071,996
UK	55,378	64,143
Sweden	71,807	73,354
Italy	6,454	2,780
China	11	32
Total	**13,499,079**	**13,174,274**

HIGHWAY MOTORCYCLE MANUFACTURER LOCATIONS

Figure 69 presents the highway motorcycles sold in the United States. Chinese, Japanese, and Taiwanese manufacturers produced a large fraction of Class Ia and Ib motorcycles while American, Japanese and European manufacturers produced the largest share of U.S. Class III highway motorcycles.

Figure 69
MY 2012-2013 Motorcycle Manufacturer Engine Families by Country of Origin

Country	Number of Engine Families	
	MY 2012	MY 2013
Austria	4	6
Canada	4	6
China[41]	104	89
Germany	0	1
India	2	2
Italy	37	35
Japan	37	40
Poland	0	1
Russia	1	1
Slovenia	1	1
South Korea	2	3
Switzerland	0	0
Taiwan	16	22
Thailand	7	9
United Kingdom	8	11
USA	54	61
Vietnam	0	1
Total	**277**	**289**

[41] Two of the 104 engine families were subsequently voided by EPA.

ATV MANUFACTURER LOCATIONS

Figure 70 presents Chinese and U.S. manufacturers produced most of the ATVs sold in the United States.

Figure 70
MY 2012-2013 ATV Manufacturer Engine Families by Country of Origin

Country	Number of Engine Families	
	MY 2012	MY 2013
Austria	3	4
Brazil	2	2
Canada	9	9
China	107	98
Italy	3	2
Japan	14	12
Mexico	1	1
Taiwan	22	24
Thailand	1	1
USA	74	76
Vietnam	1	1
Total	**237**	**230**

HEAVY-DUTY HIGHWAY MANUFACTURER LOCATIONS

Figure 71 presents the number of highway engine families (both compression ignition and spark ignition) that were certified for sale in the United States by engine manufacturing plant location.

Figure 71
MY 2012-2013 Heavy-Duty Highway CI and SI Engines by Manufacturing Location

Country	Number of Engine Families	
	MY 2012	MY 2013
USA	51	32
Japan	7	4
Germany	0	0
Brazil	0	0
Canada	1	1
Netherlands	1	0
Italy	0	0
Multiple countries[42]	0	0
Total	**60**	**37**

NONROAD COMPRESSION IGNITION MANUFACTURER LOCATIONS

Figures 72 - 74 present the number of engine families intended for use in marine diesel (both EPA and IMO certificates), locomotive, and construction/agricultural equipment applications that were certified for sale in the United States by engine manufacturing plant location or country of origin.

[42] "Multiple countries" means that engines within an engine family are manufactured in more than one country.

Figure 72 - MY 2012-2013 Marine Diesel Engine Families by Manufacturing Location

Country	Number of Engine Families	
	MY 2012	MY 2013
USA	99	96
Japan	23	13
Italy	16	16
Sweden	18	11
United Kingdom	15	12
Korea	2	24
The Netherlands	8	8
Germany	12	12
France	10	11
Mexico	0	0
Croatia	0	2
Canada	0	0
Norway	1	1
Finland	0	0
Austria	1	1
Multiple Countries	21	12
Total	**226**	**219**

Figure 73 - MY 2012-2013 Locomotive Engine Families by Country of Origin

Country	Number of Engine Families	
	MY 2012	MY 2013
USA	65	70
Multiple countries	5	4

Figure 74
MY 2012-2013 Construction and Agricultural Engine Families by Manufacturing Location

Country	Number of Engine Families	
	MY 2012	MY 2013
Brazil	1	1
China	47	2
Finland	4	4
France	7	10
Germany	76	61
India	19	14
Italy	20	16
Japan	146	105
Republic of Korea	29	16
Mexico	4	2
Slovakia	4	0
Sweden	14	16
Switzerland	9	10
United Kingdom	10	10
United States	48	54
Multiple countries	87	84
Total[43]	**525**	**405**

NONROAD SPARK IGNITION MANUFACTURER LOCATIONS

Figures 75 - 77 present the number of Small SI, Marine SI and Large SI engine families that were certified for sale in the United States by engine manufacturing plant location.

Figure 75 - MY 2012-2013 Small Spark Ignition Engine Families by Manufacturing Location

Country	Number of Engine Families	
	MY 2012	MY 2013
China	435	431
USA	220	207
Japan	134	104
Germany	14	15
Sweden	28	25
Italy	7	8
Mexico	18	14
Brazil	58	56
Multiple countries	43	64
Total	**957**	**924**

[43] This figure does not include stationary-only engine families.

Figure 76 - MY 2012-2013 Marine Spark Ignition Engine Families by Manufacturing Location

Country	Number of Engine Families	
	MY 2012	MY 2013
Japan	55	57
USA	66	70
China	17	18
Thailand	5	6
Canada	2	2
Germany	1	2
Total	**146**	**155**

Figure 77 - MY 2012-2013 Large Spark Ignition Engine Families by Manufacturing Location

Country	Number of Engine Families	
	MY 2012	MY 2013
USA	128	123
Korea	0	4
Canada	9	10
Spain	0	5
Japan	5	7
Mexico	1	1
Austria	1	1
China	0	2
Multiple countries	5	0
Total	**149**	**153**

EPA

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Agency

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